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43 CFR-3809

Environmental Impact Statement

FEBRUARY • 1999 •

DRAFT

Surface Management Regulations for Locatable Mineral Operations

99-014719

U.S. Department of the Interior • Bureau of Land Management

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The Bureau of Land Management is responsible for the balanced management of the public lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American people. Management is based upon the principles of multiple use and sustained yield; a combination of uses that take into account the long term needs of future generations for renewable and nonrenewable resources. These resources include recreation, range, timber, minerals, watershed, fish and wildlife, wilderness and natural, scenic, scientific and cultural values.

BLMWO-PL-99-001-3041

I

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Washington, D.C. 20240
http://www.blm.gov

Dear Reader:

This is the Bureau of Land Management's (BLM) draft environmental impact statement (EIS) on Surface Management Regulations for Locatable Mineral Operations (43 CFR 3809). This EIS analyzes the impacts of four possible regulatory frameworks: Alternative 1 - maintaining the existing regulations (No Action), Alternative 2 - having the states manage the program within their borders, Alternative 3 - adopting the recently proposed regulations at 43 CFR subpart 3 809 (Proposed Action), and Alternative 4 - maximizing environmental protection. We would appreciate receiving your comments on any inaccuracies or discrepancies you might find in this draft EIS; your views on the adequacy of the analysis; and your recommendations on any new impacts, alternatives, or mitigation measures that should be addressed.

The revision of BLM's 43 CFR 3809 surface management regulations has the following objectives:

- To modernize BLM rules to meet the challenges of advances in mining technology since the regulations were first issued in 1980;

- To give the public land more environmental protection from the impacts of operations conducted under the Mining Law;

- To enhance BLM's partnership with states and, to the extent possible, reduce or eliminate duplication in mining plan review, bonding, and permitting,

- To ensure that adequate financial assurances are in place for most mining-related activities so that mining operators, not the taxpayers, pay for mine cleanup and reclamation;

- To give BLM adequate regulatory enforcement provisions for dealing effectively with operations that threaten human safety or the environment

Since Secretary of the Interior Bruce Babbitt announced an initiative to change the regulations in January 1997, BLM has conducted an extensive series of meetings to obtain public comment on the need for and scope of new regulations and the environmental impact statement that analyzes the effects of the proposed changes. In addition, discussion drafts of regulations and a Scoping Report have been released to the public and posted on BLM's internet web site (http://www.btm.gov.). As a result of this outreach, BLM received several thousand public comments, which were considered in the rulemaking and EIS.

Your comments will help us move toward a final decision on how best to conduct the surface management program. I look forward to hearing from you.

Nina Rose Hatfield
Director

Surface Management Regulations
for Locatable Mineral Operations
(43 CFR 3809)

Draft Environmental Impact Statement

Prepared by
U.S. Department of the Interior
Bureau of Land Management

Washington, D.C.
February 1999

Surface Management Regulations for Locatable Mineral Operations
(43 CFR 3809)
Environmental Impact Statement

Draft (X) Final ( )

The United States Department of the Interior, Bureau of Land Management.

1. Type of Action: Administrative (X) Legislative ( )

2. Abstract: BLM is proposing to change the regulations in 43 CFR subpart 3809 for its program to manage operations conducted under the General Mining Law of 1872, as amended, and section 302 of the Federal Land Policy and Management Act of 1976 (FLPMA). This action is intended to modernize and improve the regulations, while increasing environmental protection and facilitating coordination and cooperation with state regulatory agencies having a role in mine permitting.

   This draft environmental impact statement (EIS) is a national-level, programmatic EIS. It documents the economic, social, environmental, and ecological impacts that would result from alternative frameworks for the BLM surface management program regulating locatable mineral operations on public lands. The Proposed Action is to adopt the recently proposed regulations at 43 CR 3809. Other program alternatives analyzed in this EIS include the following: maintaining the existing regulations (No Action), allowing each state to regulate locatable mineral operations on public lands within its borders (State Management), and adopting regulations that maximize environmental protection while still allowing locatable mineral activities (Maximum Protection).

3. For further information call:

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4. Comments on the draft EIS must be received no later than 60 days after the EIS notice of availability is published in the *Federal Register*. Comments should be sent to:

   3809 Draft EIS comments
   Attention: Paul McNutt
   P.O. Box 12000
   Reno, NV 89520-0006

   Comments may also be sent electronically to 3809EIS@wo.blm.gov.

Comments on the draft EIS should be as specific as possible and address the adequacy of the EIS and your recommendations on any new impacts, alternatives, or mitigation measures that should be addressed.

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Summary

This draft environmental impact statement (EIS) analyzes the Bureau of Land Management's (BLM) surface management program for locatable mineral operations on BLM-administered lands. The EIS analyzes the environmental impacts of the existing regulations and alternatives to the existing regulations for the relevant issues identified during the scoping process.

Purpose and Need

The purpose of the Proposed Action is to address issues that have developed since the program began in 1981 and to improve BLM's management of locatable mineral activities on the public lands. Congress, the General Accounting Office, BLM, and the public have increasingly recognized the need for improvement in BLM's Surface Management Program under the existing 3809 regulations. In considering these issues, BLM has recognized the need for provisions to address gaps that are not adequately covered in the existing 3809 regulations. Specific program issues have been recognized through scoping and are listed later in this EIS. The purpose of the proposed action is to adopt regulations that would address the issues and improve BLM's management of locatable mineral activities on the public lands.

Authority

The General Mining Law of 1872, as amended, allows the location and use of mining claims on sites "...under such regulations prescribed by law," 30 U.S.C. 22, 26 and 28.

Section 302 of the Federal Land Policy and Management Act (FLPMA) addresses the management of use, occupancy, and development of the public lands. Section 302(b) of FLPMA recognizes the entry and development rights of mining claimants while directing the Secretary of the Interior to "...by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands." The effect of this and other legislation is to authorize BLM to regulate mineral activities so as to prevent unnecessary or undue degradation on BLM-managed lands open to operations under the Mining Law. The 43 CFR 3809 regulations (3809 regulations) were prepared to meet that legislative intent.

The 3809 regulations apply to lands that are open to exploration and development under the Mining Law. The regulatory framework is not to decide "if" mining should be allowed but to regulate "how" activities already authorized by the Mining Law are to be conducted to prevent unnecessary or undue degradation. This framework gives BLM much discretion in regulating how exploration and mining are conducted on public lands but less discretion in determining whether exploration and mining should occur if the lands are legally open to operation of the Mining Law. Other processes, beyond the scope of the 3809 regulations, are used to close lands to exploration and development under the Mining Law. Such processes include administrative and congressional withdrawals.

History of the Regulations

BLM adopted the 3809 regulations in 1981 after completing a programmatic EIS (BLM 1980). Briefly, these regulations classify surface disturbance into three categories, casual use, Notice, and Plan of Operations. Casual use involves only negligible disturbance with hand tools and does not require the operator to notify BLM. Notice-level operations use mechanized earth-moving equipment and disturb 5 acres or less in any calendar year. For these operations BLM must be notified 15 calendar days in advance to ensure that the activity does not cause unnecessary or undue degradation. A Plan of Operations is required for more than 5 acres of surface disturbance or surface disturbance in one of BLM's special status areas such as areas of critical environmental concern. BLM must review and approve a Plan of Operations before an operation begins. Since approval of a Plan of Operations is a federal action, an environmental assessment (EA) or EIS must be prepared. Reclamation bonding can be required only for a Plan of Operations under the existing regulations or for a Notice if the operator has a record of noncompliance.

When the regulations were published in 1981, BLM made a commitment to review their effectiveness after 3 years. In 1985 a BLM work group formed to consider changes to the regulations relating to reclamation bonding. In 1989 BLM began a surface management initiative to make policy changes for cyanide use and compliance inspections in response to growing criticism of its managing of mining operations, particularly the issues of wildlife deaths, failure to perform reclamation, and residential occupancy not incident to mining. These issues were the subjects of reports prepared by the U.S. General Accounting Office (1986, 1987a,b, 1988, 1989, 1990, 1991a). In 1992 a task force of BLM specialists collected public comments and recommended changes to the 3809 regulations. In 1993 this revision effort was put on hold because it appeared that pending changes in the Mining Law would supersede any changes in the surface management regulations.

Although these initiatives did not lead to overall revision of the 3809 regulations, the surface management program has undergone several important policy changes since 1981. A cyanide management policy was developed in 1990, and state-specific cyanide management plans were adopted to give guidance for managing cyanide use on public lands under the existing regulations. In 1992 the BLM *Solid Minerals Reclamation Handbook* (1992b) was completed to give guidance on reclamation practices. In 1996 BLM issued an acid rock drainage policy as guidance for program staff and managers to regulate mining. Also in 1996 BLM published the regulations at 43 CFR 3715 on occupancy of mining claims.

In early 1997 BLM revised the 3809 regulations for reclamation bonding. These changes were intended to address some of the problems BLM was experiencing with maintaining adequate reclamation bonds and improving its enforcement program. But the 1997 regulations were challenged in court by the Northwest Mining Association for failure to follow the requirements of the Regulatory Flexibility Act in relation to assessing the effects on small entities. In May 1998 the U.S. District Court ruled against BLM, and the 1997 regulation revision is no longer in effect (*Northwest Mining Association v. Babbitt*, No. 97-1013, D.D.C. May 13, 1998).

Consultation, Coordination, and Public Participation

Consultation and Coordination

No cooperating or joint lead agencies participated in preparing this EIS. BLM coordinated with the state regulatory agencies, American Indian tribal governments, and other federal agencies, including the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and the Bureau of Indian Affairs, on developing the proposed regulations and preparing the draft EIS.

The importance of federal-state consultation and coordination was established at the beginning of this effort to review and revise the 3809 regulations. In his January 6, 1997, memorandum directing the Bureau of Land Management to start the rulemaking process, the Secretary of the Interior directed that "Coordination with state regulatory programs should be carefully addressed, to ensure that FLPMA's purpose of avoiding unnecessary or undue degradation is achieved, while minimizing duplication and promoting cooperation among regulators."

BLM started working closely with the governors and state agencies of the "Mining Law" states before issuing the Notice of Intent to Prepare an EIS. BLM continued this consultation through the issuance of the Notice of Availability of this EIS. The importance of this consultation and coordination was reiterated in the 1998 Interior Appropriations Act, which directed the Secretary of the Interior to certify he had consulted with the affected states before issuing regulatory changes. On April 8, 1997, March 3, 1998 and again on September 22, 1998, the BLM team drafting the regulations participated in meetings hosted by the Western Governors' Association. These meetings with representatives of western state governments and government agencies focused on their concerns about the concepts and provisions in drafts of the proposed regulations. Written comments on the drafts were also solicited from each of the states. The Western Governors' Association was a conduit to facilitate much of the consultation with the states. Both Department of the Interior and BLM officials directly contacted affected state governors and state regulatory agencies.

To obtain input from American Indians, BLM consulted and coordinated with the Bureau of Indian Affairs, American Indian Indian Congress, and tribal governments. Key points of consultation and coordination included a presentation to the Indian Minerals Steering Committee by Robert Anderson, Deputy Assistant Director for Minerals, Realty, and Resource Protection. Preliminary draft regulations were also distributed to potentially affected tribal governments. And information briefing/public meeting was also held on the Fort Belknap Indian Reservation.

While developing the proposed regulations and preparing the draft EIS, BLM consulted informally with the U.S. Fish and Wildlife Service and U.S. National Marine Fisheries Service on the proposed regulations. Before issuing the final EIS, a determination will be made on the need for formal consultation on this rulemaking. Before BLM approves a site-specific plan for surface-disturbing actions under the 3809 regulations, site-specific consultation can be required in compliance with Section 7 of the Endangered Species Act. Also before authorizing surface disturbance, BLM would list cultural resources on and eligible for inclusion on the National Register of Historic Places or consider the effects of a site-specific proposal under Section 106 of the National Historic Preservation Act of 1966.

Public Participation

The EIS public participation process consists of several phases. Public participation begins with scoping, which helps determine issues and select alternatives for analysis before any decisions are made. Information gathered during scoping was analyzed and used in determining the issues addressed and the alternatives presented in detail in the draft EIS.

The draft EIS is subject to further public review and comment during the public comment period. Following the comment period, BLM will prepare the final EIS, which will incorporate any other comments received during the review period.

Encouraging public involvement throughout the process ensures that the process is open and considers information from all interested parties, including other federal agencies; state, local, and American Indian tribal governments; the scientific community; professional, conservation, and trade organizations; public land users and stakeholders; and citizens at large.

In January 1997 the Secretary of the Interior directed BLM to continue with the regulation review process promised in 1981 and begun in 1991. Because of the time that had passed since the 1991 effort, BLM started a new public participation process in early 1997 and requested from its field offices comments on the existing regulations and suggestions for improvement. Public participation was encouraged by engaging in prescoping outreach to special interest groups and government officials; conducting scoping for the EIS, including a formal 81-day comment period and 19 public meetings in 12 cities; and placing working drafts of the proposed regulations on

BLM's internet web site. Formal 60-day comment periods for this EIS and the proposed 3809 regulations provide further opportunities for public participation and commentary.

In March 1997 BLM issued a press release to announce the revision effort and formed a task force of agency people with experience in the program to coordinate public involvement, develop regulation options, and oversee preparing an EIS on the effect of any changes in the regulations. From March through May 1997 BLM held briefings on the revision process for conservation and industry groups; congressional offices; and local, state, and federal government agencies. Although this outreach effort occurred before and not as part of the formal scoping process, BLM considered the views expressed in developing the proposed rules and draft EIS.

On April 4, 1997 a *Federal Register* notice announced preparation of the EIS, requested comments on the scope of the analysis in the EIS, and set forth a schedule for public scoping meetings. To collect a wide range of comments, BLM arranged for public meetings to be held at a variety of locations across the country in the spring of 1997.

Beginning in April 1997, information packages were sent to all BLM offices for distribution to the interested public. These packages contained the Secretary's January 1997 letter initiating the regulation review, a briefing summary of the development of the current regulations and associated policies, the proposed regulation and EIS schedules, and an explanation of the proposed process for reviewing and revising the regulations and developing the EIS. These information packages were mailed to interested or affected stakeholders, given out at BLM offices, and distributed at meetings with interest groups. In addition, a summary of the scoping comments from the aborted 1991 reform effort was given to interested parties.

To establish a framework for the scoping process BLM presented a list of topics in the Secretary's memo that had previously been named as program issues: (1) the definition of *unnecessary or undue degradation*, (2) the need to develop specific performance standards for mining and reclamation, (3) the 5-acre disturbance threshold between a Notice and a Plan of Operations, (4) the effectiveness of coordination among state and federal regulators, (5) the type and adequacy of penalties for violating the regulations, (6) the review time frames for Notices and Plans of Operations, (7) the definition of *casual use*, and (8) the requirements for reclamation bonding. Participants were also invited to comment on any other issues relating to the surface management program.

Scoping comments were formally accepted through June 23, 1997, although the record remains open until the final regulations are completed. In addition to oral comments at the public meetings, BLM received 1,832 comment letters on revising the 3809 regulations. A comment analysis team was formed to review the comments. In summarizing the scoping comments, the team grouped them by (1) comments concerning the eight issue topics originally selected by BLM, (2) comments that raised new issues, (3) comments with suggestions for preparing the EIS, and (4) comments on the scoping process itself. In addition, comments by BLM field office staff were grouped as such. The results of the comment analysis were given to the two teams working on the regulations and the draft EIS. In September 1997 a scoping report (BLM 1997a) summarizing the comments received through June 23, 1997 was distributed to all parties who submitted comments or expressed an interest in the rulemaking or EIS.

In February 1998 BLM requested reviews and comments on an initial working draft of the proposed regulations from federal, state, local, and tribal officials. In addition, the draft was released for public review and placed on the internet. In response to comments, BLM prepared a second draft and posted it on the internet on August 11, 1998. BLM's internet web site was updated regularly to give users the latest information on working drafts of the regulations, schedules, and other salient information on the project. As of November 17, 1998 there were 12,879 visits to the internet site. From the end of the comment period on

June 23, 1997 through the publishing of the Notice of Availability for the draft EIS, BLM received more comment letters and messages. Comments received after June 23, 1997 have also been reviewed by the Regulation Team and the EIS Team.

Distribution

The draft EIS, along with the proposed rules, were released for public review and comment during a 60-day public comment period. One copy of the draft EIS was mailed to each person and organization that gave comments during scoping or expressed an interest in the rulemaking or EIS. In addition, copies of the draft EIS have been sent to organizations that may not have submitted comments: congressional offices; federal, state, and local agencies; tribal governments; and conservation and trade organizations. Copies of the EIS and the regulations have been posted on BLM's internet web site.

Regulation Development and EIS Processes

Revision of the 3809 regulations is proceeding under section 553 of the Administrative Procedures Act (APA), 5 U.S.C. 553. BLM has determined that the proposed changes constitute a major federal action significantly affecting the human environment. Therefore, under the National Environmental Policy Act (NEPA) an EIS must be prepared.

The rulemaking and EIS processes have been combined wherever possible to eliminate duplication. Concurrent comment periods, including public hearings on both the draft EIS and proposed regulations, are being held to solicit public comments according to the requirements of APA and NEPA. Persons wishing to assure that their comments will be considered in the preparation of a final rule are urged to submit comments during the comment period, even if they repeat earlier submittals to BLM.

The final EIS will incorporate comments and changes resulting from the public comment period. The publication of the final EIS will be announced in the *Federal Register*. No sooner than 30 days after the final EIS's publication, the Secretary of the Interior will issue a record of decision, which may be incorporated as part of the preamble to the final rule. At the same time, the final rules will be published in the *Federal Register*.

Issues

The scoping effort helped BLM determine the issues that needed to be considered in the rulemaking and EIS processes. These issues include the following.

- Definition of unnecessary or undue degradation
- Performance standards for operations and reclamation
- Definition of federal lands
- The threshold for a Notice or Plan of Operations
- Definition of casual use
- Notice and Plan of Operations processing and contents
- State government coordination
- Claim Validity and Valid Existing Rights
- Common variety minerals
- Inspection and monitoring programs
- Type and adequacy of penalties for noncompliance
- Reclamation bonding requirements
- Appeals Process
- Definition of project area
- Existing operations

The following issues were raised but are not within the scope of the 3809 regulations and are not specifically addressed through this rulemaking process or used to develop alternatives in the EIS.

- The 1872 Mining Law
- American Indian trust responsibilities
- Citizen Suits

- BLM Cost Recovery
- Agency funding and staffing
- National Environmental Policy Act processing of Plans of Operations
- Abandoned mine lands
- Diligent development
- Public availability of information
- Combining the 3809 regulations with occupancy regulations
- Consistency with the Forest Service regulations

Developing the Alternatives

Four alternatives have been developed, including the Proposed Action and the No Action alternatives. Alternative 1 (Existing Regulations, No Action) would have BLM continue to use the existing 3809 regulations. Alternative 2 (State Management) would remove BLM from routine regulation of mineral activities and rely exclusively on state programs to regulate mineral activities on BLM-managed lands. Alternative 3 (Proposed Action) contains BLM's proposed regulations that constitutes the Proposed Action and BLM's Preferred Alternative. Alternative 4 (Maximum Protection) would increase both the level of environmental protection and impose a design-oriented regulatory approach led by BLM. This alternative provides the maximum protection to the environment within the range of alternatives in this EIS.

The development of alternatives centered on addressing regulatory issues in five general areas: (1) coordination between BLM and state regulatory agencies, (2) the Notice-Plan of Operations threshold, (3) defining performance standards, (4) financial assurance for performance of reclamation, and (5) regulation enforcement and penalties for noncompliance. Although other relevant issues were considered, these significant issues played a major role in defining the alternatives to be analyzed in detail.

State-Federal Coordination

A significant issue consists of maintaining and improving coordination between the states and BLM and determining the relative level of responsibility for regulating mineral exploration and development. Alternatives developed to address this issue range from turning the program entirely over to state regulation to having BLM always assume the lead role for regulating activities on public lands.

Notice or Plan of Operations (Plan) Threshold

A Notice is required for surface disturbance of 5 acres or less within a calendar year, whereas a Plan of Operations is required for disturbance of more than 5 acres within a calendar year or disturbance of any size exceeding casual use in special status areas. BLM received a wide range of comments on this threshold. Some commenters wanted the threshold left as it currently exists. Others were concerned that allowing operations to be conducted under a Notice was never proper because no National Environmental Policy Act review or opportunity for public involvement was required.

Performance Standards

An important part of the 3809 regulations consists of the standards that govern how operators must control the extent of impacts on the ground. Alternatives were developed to address comments on (1) the environmental resources for which standards should be developed, (2) whether those standards should be design or outcome oriented, and (3) the level of environmental protection the standards should give. Every alternative includes compliance with other state or federal laws and regulations as a minimum performance standard.

Financial Assurance (Bonding)

The adequacy of financial assurance requirements, generally referred to as bonding, and what these requirements should cover were the subject of comments. Typically, bonding is required as a compliance tool to ensure that the required reclamation is performed should the operator be unable or unwilling to do so. With the recent district court case on BLM's 1997 bonding regulations, the issue of reclamation bonding is even more relevant today than when the regulation revision process began. Alternatives for addressing the issue of bonding have been developed in response to comments.

Enforcement and Penalties

BLM received many comments on enforcement and penalties. The enforcement provisions in the alternatives range from maintaining the existing system to establishing mandatory administrative penalties and permit blocks for noncompliance. The range of alternatives developed for enforcement and penalties respond to comments that who assert that enforcement is not a large problem to comments that assert that existing enforcement programs are not strong enough.

Description of the Alternatives

Tables 2-1 and 2-2 in Chapter 2 of the EIS summarize each of the components of each alternative.

Alternative 1: Existing Regulations (No Action)

Under Alternative 1 the existing surface management regulations would continue to be used, and no changes would be made. These are essentially the same regulations that have been in effect since 1981. Over the years BLM has developed policy documents, manuals, and handbooks as guidance on how to implement the regulations. Appendix A contains the existing 3809 regulations.

Alternative 2: State Management

Under Alternative 2 BLM would defer regulating exploration and mining to the states. The 3809 regulations would define *unnecessary or undue degradation* to mean failure to meet all local, state, and federal laws and regulations for exploration and mining operations. BLM would neither review nor approve any specific project. Nor would any federal decision or undertaking be subject to NEPA review or compliance with Section 106 of the National Historic Preservation Act. Operations would still have to comply with federal laws such as the Clean Water Act and Endangered Species Act., but they would not be regulated by BLM.

Alternative 3: Proposed Action (Preferred Alternative)

Major provisions of the proposed regulations would include selecting performance standards that all operations would have to meet for environmental protection; replacing the "prudent operator" standard in the current definition of unnecessary or undue degradation with a requirement to comply with the performance standards; adjusting the "threshold" for casual use, Notice-level operations, and filing Plans of Operations (an alternative threshold was also developed for the Proposed Action, adopting the Forest Service approach, which determines the threshold between Notice-level activity and Plans on a case-by-case basis); increased bonding coverage to include Notice-level activity and requiring bonding at 100% of reclamation costs; extending the regulations to include Stock Raising Homestead Act lands; increased inspections under some circumstances; and the discretion to issue administrative penalties. The Proposed Action would also give states whose programs are at least as stringent as BLM's requirements the lead to administer the surface management program when they request it.

Alternative 4: Maximum Protection

Alternative 4 would contain prescriptive design requirements for resource protection. These requirements would increase the level of environmental protection and give BLM more discretion in determining the acceptability of proposed operations. Major changes from the current regulations include numerical performance standards for mineral operations, required pit backfilling, elimination of Notices so that all disturbances greater than casual use would require a Plan of Operations, a requirement for conformance with land use plans, and prohibitions against causing irreparable harm or having to permanently treat water.

Summary of Impacts

Table 2-3 in Chapter 2 summarizes the environmental, social, and economic impacts of each alternative.

Alternative 1: Existing Regulations (No Action)

Continuation of current management would affect environmental conditions, the mining industry, and communities in the same ways as in the past. Generally, mining activity is expected to remain relatively steady or slightly increase, depending mainly on conditions in commodity markets. Mining-related impacts to water and air quality, soil, vegetation, wildlife, fisheries, riparian-wetlands areas, and other resources are expected to continue at current rates. Economic activity is also expected to continue at current rates or to slightly increase, depending on market conditions. Social conditions would not change appreciably.

Alternative 2: State Management

Impacts under the State Management Alternative would be similar to those under Alternative 1. Mining activity is expected to increase overall in the study area by about 5%, although not necessarily in all locations. For example, activity might not increase in California and Montana because these states have environmental review provisions similar to the federal National Environmental Policy Act requirements. A proportionate increase in mining-related impacts to water and air quality, soil, vegetation, wildlife, fisheries, riparian-wetlands areas, and other resources is also expected. Mining-related economic activity would increase by 5%.

Alternative 3: Proposed Action (Preferred Alternative)

Under the Proposed Action mining activity is expected to decrease overall by about 5%, although not necessarily in all locations. The main provisions of the new regulations that would affect mining activity would be establishing performance standards, changing the "threshold" for casual use and Notice and Plan-level operations; and increasing bonding levels. Mining-related impacts to water and air quality, soil, vegetation, wildlife, fisheries, riparian-wetlands areas, and other resources are expected to decrease proportionately. Mining-related economic activity would decrease by 5%. Mining activity might not decrease in some states, such as Nevada, if most provisions of the Proposed Action are already in place.

Alternative 4: Maximum Protection

Alternative 4 would provide the most environmental protection of the four alternatives. It also has the potential to create the largest decrease in mining activity of all alternatives, up to a 30% depending on mine type. Open pit mining is estimated to decrease the most—30%—whereas strip mining (the typical method for many industrial minerals) is expected to decrease the least—about 5%.

Provisions expected to have the greatest effect in reducing the level of future mining include mandatory backfilling and other restrictive environmental performance standards for reclamation, some specific technology design standards, the elimination of Notices, and the establishing of suitability criteria. Mining-related impacts to water and air quality, soil, vegetation, wildlife, fisheries, riparian and wetlands areas, and other resources are expected to decrease proportionately for future operations. In addition, the higher environmental performance standards would further decrease environmental impacts at ongoing and future operations.

Economic activity overall would decrease by about 29% but would vary significantly by state, depending on mine type and commodities most prevalent. Nevada is expected to experience the greatest decline in mining (30%). States such as Wyoming and Oregon, where industrial mining is most prevalent and there is little to no base- or precious-metal mining, would see much smaller decreases in activity—about 5%. Depending on the degree of mining dependence in a community, this alternative could significantly affect social conditions.

Alternatives Considered but Eliminated

The alternatives considered in detail represent a reasonable range of alternatives to address the issues recognized by scoping. All of the major technical and regulatory issues are considered in at least one of the alternatives analyzed in detail. Other issues, such as mining law reform, cannot be resolved through rulemaking and were not used in developing alternatives.

Other alternatives considered but eliminated from detailed analysis include an alternative that would consider funding levels or mandating complete funding of the existing regulations and an alternative requiring complete restoration to premining conditions.

The complete funding alternative was eliminated as redundant. The EIS analysis needs to assume the complete implementing of alternatives to fully consider the potential environmental impacts of an alternative's being selected. The analysis of the existing regulations (Alternative 1) is based upon complete implementation of that alternative, which implies complete funding. Complete implementation is also assumed for Alternatives 2, 3, and 4 when potential impacts are assessed. The EIS does provide estimates of the relative cost to implement each alternative. Although regulatory programs are often underfunded, assuming complete implementation when presenting the impacts allows the public and the decisionmaker to see the relative cost versus benefits that might be achieved under the regulatory scheme of each alternative.

In developing a preferred alternative for consideration in the final EIS, two approaches may be taken if adequate funding appears not to be likely. The alternative may be modified to reduce implementation costs. Or it may remain unchanged with the recognition that complete implementation would require adequate funding.

The alternative of requiring total restoration of disturbed lands to premining conditions was also considered but eliminated from detailed analysis. Complete restoration would require restoring the premining topography with the same habitat composition and productivity levels. In contrast, reclamation requires attaining a stable and productive land area though not necessarily replacing the same predisturbance habitat or exact topography. Both the technical and economic difficulties of completely restoring disturbed lands would make most mining operations on public lands infeasible. Complete restoration would conflict with BLM's multiple use mandate and would offer little commensurate environmental

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Chapter 1
Introduction: Purpose of and Need for Action

This draft environmental impact statement (EIS) analyzes the Bureau of Land Management's (BLM) surface management program for locatable mineral operations on BLM-administered lands. The existing surface management regulations are contained in 43 CFR 3809 (Appendix A). The EIS analyzes the environmental impact of the existing regulations and alternatives to the existing regulations for the relevant issues recognized during the scoping process.

Chapter 1 explains the overall purpose of and need for action, gives a brief background and summary of relevant laws and regulations, and discusses issues suggested by the public and BLM employees for consideration in the rulemaking process.

Purpose of and Need for Action

The purpose of the Proposed Action is to address issues that have developed since the program began in 1981 and to improve BLM's management of locatable mineral activities on the public lands. Congress, the General Accounting Office, BLM, and the public have increasingly recognized the need for improvement in BLM's Surface Management Program under the existing 3809 regulations. Issues of concern include the following:

- BLM's effectiveness and consistency in the day-to-day implementing of the regulations in the field.
- Environmental protection for operations conducted under the mining laws.
- Working relationships with state regulators, and reducing or eliminating duplication of mining plan review, bonding, and permitting.
- Receiving market value for common variety minerals.
- The validity of mining claims within areas closed to mining.

In considering these issues, BLM has recognized the need for provisions to address gaps that are not adequately covered in the existing 3809 regulations. These gaps include the following:

- Discretionary bonding exists only for Plan-level activity, and no bonding is required for Notice-level activity.
- Some operations with high environmental risks have been allowed to proceed without BLM approval simply because they disturb less than 5 acres during any calendar year.
- BLM lacks provisions for suspending or nullifying operations that disregard enforcement actions or pose a imminent danger to human safety or the environment. Criminal penalties under the existing regulations have often proven ineffective. And BLM cannot use civil penalties as an enforcement tool under the existing regulations.
- Mitigation is not defined to allow BLM to request compensation where sites cannot be reclaimed to the point of providing plants, animals, and people the same benefits that existed before disturbance.
- The lack of clarity in the types of activities permissible under "casual use" has led to inconsistencies and occasionally environmental damage.

- BLM lacks clear, consistent standards for environmental protection.
- BLM has no official way of clearing records. Notice-level activities are often never completed, or in some cases never started.
- BLM has no requirements for determining if a mineral is common variety and therefore "saleable" or for establishing escrow accounts before mining begins.
- No requirements exist for preventing disturbances in areas closed to mineral entry a discovery is determined to be valid or not.

Specific program issues have been recognized through scoping and are listed later in this chapter. The purpose of the proposed action is to adopt regulations that would address the issues and improve BLM's management of locatable mineral activities on the public lands.

The Regulation Development and EIS Processes

Revision of the 3809 regulations is proceeding under Section 553 of the Administrative Procedures Act (APA), 5 U.S.C. 553. BLM has determined that the proposed changes constitute a major federal action significantly affecting the human environment. Therefore, under the National Environmental Policy Act of 1969 (NEPA) an environmental impact statement (EIS) must be prepared.

The rulemaking and EIS processes have been combined wherever possible to eliminate duplication. Concurrent comment periods, including public hearings on both the draft EIS and proposed regulations, are being held to solicit public comments according to the requirements under APA and NEPA.

The integration of the NEPA and APA processes during the revisions of the 3809 regulations is procedurally complex. Interaction between the preparers of the proposed regulations and the interdisciplinary team preparing the EIS resulted in several internal iterations of analysis before the proposed regulations were developed.

The two acts also have their own scheduling requirements. The Council on Environmental Quality (CEQ) regulations implementing NEPA require a 90-day period after publishing the notice of availability of the draft EIS in the *Federal Register* before a decision and 30 days after the publishing of the notice of availability for the final EIS. The Administrative Procedures Act requires a 30-day delay in the effective date after the final regulations are published.

The EIS is not itself a decision document. It is a document to help decisionmakers by disclosing the environmental consequences of implementing the proposed action and its alternatives. After the final EIS is published, the decision will be issued in a record of decision. But the record of decision will not contain site-specific decisions related to any mining proposals. Decisions on any future mining proposals will be made on a case-by-case basis.

Other requirements for a rulemaking include preparing a cost-benefit analysis. Although related to the economic analysis in the draft EIS, the cost-benefit analysis involves different assumptions and is prepared for different purposes. (For information on this cost-benefit analysis, write to the Bureau of Land Management, Administrative Record, Room 401 LS, 1849 C Street NW, Washington, D.C. 20240.)

BLM Authority and Responsibilities

The General Mining Law of 1872, as amended, allows the location and use of mining claims on sites "...under such regulations prescribed by law," 30 U.S.C. 22, 26 and 28.

Section 302 of the Federal Land Policy and Management Act (FLPMA) addresses the management of use, occupancy, and development of the public lands. Section 302(b) of FLPMA recognizes the entry and development rights of mining claimants while directing the Secretary of the Interior to "...by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands."

The effect of these requirements and other legislation is to authorize BLM to regulate mineral activities so as to prevent unnecessary or undue degradation on BLM-managed lands open to operations under the Mining Law. The 43 CFR 3809 regulations (3809 regulations) were prepared to meet that legislative intent.

The 3809 regulations apply to lands that are open to exploration and development under the Mining Law. The regulatory framework is not to decide "if" mining should be allowed but to regulate "how" activities already authorized by the Mining Law are to be conducted to prevent unnecessary or undue degradation. This framework gives BLM much discretion in regulating how exploration and mining are conducted on public lands but less discretion in determining whether exploration and mining should occur if the lands are legally open to operation of the Mining Law. Other processes, beyond the scope of the 3809 regulations, are used to close lands to exploration and development under the Mining Law. Such processes include administrative and congressional withdrawals.

Cooperating Agencies

No formal cooperating agencies were designated for preparing this EIS. Coordination was conducted with individual state regulatory agencies through the Western Governors' Association and with other federal agencies in developing the proposed regulations. (See Chapter 4, Consultation, Coordination, Public Participation, and Preparers.)

Development of the Mining Law and Mineral Policies

Before 1866 the United States lacked comprehensive legislation that defined mineral rights and access to minerals on the public lands. From 1797 to 1855 several partial leasing acts (covering lead, iron, salt, and copper) and the Cash Sale Act of 1826 allowed the sale for $5 an acre of lands surveyed by the United States and classified as mineral lands. The rest of the public land could be purchased for $1.25 an acre. Except for the Cash Sale Act these acts all expired before 1855.

The 1849 California gold rush and the 1854 Nevada silver rush (to the Comstock silver lode in Virginia City) radically changed the entire perspective on mineral rights, access to minerals, and mineral titles on the public lands. Arriving by the thousands from the East Coast and disembarking in San Francisco, miners established themselves along the California mother lode belt (the western Sierra Nevada). Exploring ever eastward, they established hundreds of mining camps in the Sierra Nevada and in the Virginia Range in Nevada.

In the absence of federal legislation on mining rights and titles, the miners established their own rules for acquiring mineral rights, mining claims, and diligence (assessment work). Though everyone was technically in trespass on the public domain, rules were devised in each mining district based upon the Spanish Royal Codes of 1783 and the English customs and traditions of the Cornwall and Devon tin and lead districts. Surviving records show that by 1860 California, Nevada, and Arizona had some 650 mining districts, each with its own rules.

In 1866 Congress finally reacted by passing the Lode Law, which applied only to lode claims. The Lode Law recognized the existing rules of the mining districts, required assessment work for keeping claims, and allowed the patenting of mining claims. In 1870 the Lode Law was amended by the Placer Act, which treated placer claims in a similar manner to lode claims. In 1872 Congress revised the Lode and Placer Acts, added amendments to protect agricultural rights, established federal rules, and passed what is today called the General Mining Law of 1872 or the Mining Law.

U.S. mining laws class minerals as locatable, leasable, or salable. Locatable minerals are neither leasable minerals (e.g. oil, gas, coal, oil shale, phosphate, sodium, potassium, sulfur, asphalt, or gilsonite) nor salable mineral materials (e.g. common variety sand and gravel). Locatable minerals include copper, lead, zinc, magnesium, nickel, tungsten, gold, silver, bentonite, barite, feldspar, flourspar, and uranium. Only locatable mineral deposits may be staked and claimed under the Mining Law.

Under the Mining Law all valuable mineral deposits on lands belonging to the United States are free and open to entry, location, and patent. When minerals are found in enough quantity and quality on public land open to mineral entry, a person who locates a mining claim in compliance with regulations prescribed by law has the exclusive right of possession and enjoyment of the surface area of the claim and the mineral veins, lodes, and ledges within the claim as well as extra-lateral rights.

Principles of the Mining Law

The Mining Law consists of five basic elements:

- discovery of a valuable mineral,
- location of mining claims,
- recordation of claims,
- maintenance, performance of annual requirements on claims,
- patenting of the mineral, and possibly surface, estate to the claimant.

Discovery

No federal statute defines what constitutes a valuable mineral deposit, but several judicial and administrative rulings or declarations have been made on the subject. In 1894 in the case of *Castle v. Womble* the Department of the Interior established the "prudent person rule." This rule states the following:

> "...where minerals have been found and the evidence is of such a character that a person of ordinary prudence would be justified in the further expenditure of his labor and means, with a reasonable prospect of success in developing a valuable mine, the requirements of the statutes have been met."

This definition was affirmed by the United States Supreme Court in 1905.

In 1968 in the case of *U.S. v. Coleman* the Supreme Court approved the marketability test as a complement to the prudent person rule. This test requires a showing of marketability to confirm that a mineral could be mined, removed, and marketed at a profit. In other words, the marketability test considers economics, requiring claimants to show that they have a reasonable prospect of selling material from a claim or a group of claims. The material does not have to have been sold or to be selling at a profit. There just needs to be a reasonable likelihood that it could be sold at a profit. Demonstrating an established market for precious and base metals is not difficult because of the international acceptance of metals and their universal needs. For industrial minerals the demonstration of a market is harder to establish because these markets are regional.

Location

Mining claims may be located only by citizens of the United States, persons who have declared an intention to become citizens, and corporations organized under any state law. Mining claims may be located only on public domain lands open to mineral entry under the mining laws and only for mineral commodities considered to be "locatable." A mineral is locatable if it is in the public domain and is a metallic mineral or an uncommon variety mineral valuable chiefly for chemical rather than physical properties. Upon discovery of a valuable mineral on unappropriated public domain land a mining claim may be located. This claim grants the locator an exclusive possessory right to the mineral deposit. This possessory right allows the locator to continue to develop the claim as provided for by law. A mining claim is a valid right against the United States and other claimants only if a valuable mineral deposit has been discovered.

There are four types of mining claims. The main types are lode and placer. Lode claims are located on bedrock, whereas placer claims are usually located on loosely consolidated materials such as mineral-bearing sands and gravels. Two other types of mining claims may be located under the Mining Law: mill sites and tunnel sites. A mill site may be located on unappropriated public domain land that is nonmineral in character and may be used for erecting a mill or reduction works, or for other uses reasonably incident to support of a mine. A tunnel site may be located on land where a tunnel is run to develop a vein or lode, or for intersecting unknown veins or lodes.

The actual location of a mining claim involves posting a notice of location at the discovery point and erecting corner posts, or monuments, on the ground to ensure that the claim boundaries are readily identifiable.

Recordation

Before the Federal Land Policy and Management Act of 1976 (FLPMA) claimants were required to file their location and assessment notices only in the office of the county recorder or county clerk in the county in which the claim was located. As required by FLPMA, notices of location and other notices must be filed with the BLM state office as well as the county recorder. This requirement has allowed BLM to generally know the number and types of claims located on public land and their current status. To file a mining claim the claimant must also pay a recordation fee. Failure to file these documents and pay the fee can constitute abandonment of a mining claim.

Maintenance

The Mining Law requires the annual performance of at least $100 worth of labor or improvements to retain a possessory interest in the claim or site. An affidavit of assessment work must be filed with both the county recorder and with the BLM state office. Owners of mill and tunnel sites are not required to file assessment work but must file a notice of intent to hold the site. Congress has changed the annual assessment work requirement by substituting a requirement to pay a $100 claim maintenance fee per mining claim to BLM. A claimant with fewer than 10 mining claims can perform the assessment work and file a small-miner exemption. Failure to pay the maintenance fee or obtain a waiver from BLM will constitute forfeiture of a mining claim.

Patents

One need not have a patent to mine and remove minerals from a mining claim. A patent gives the owner exclusive title to the locatable minerals and in most cases to the surface estate. To obtain patent, claimants must do the following:

- Perform at least $500 worth of development work per claim.
- Have a mineral survey and plat prepared at their expense.
- Show that they hold possessory rights by chain of title documents.
- Publish a notice for potential adverse claimants to assert their claims.
- Demonstrate discovery of a valuable mineral deposit within the meaning of the Mining Law.

Upon satisfactory completion of the above requirements claimants can purchase their mining claims at $2.50/acre for placer claims and $5/acre for lode claims.

Since 1994 Congress has established and continued a moratorium on filing new patent applications. The only patents now being processed are those that have received the first half of the mineral entry final certificates.

Mining Law Amendments

The Mining Law has been amended several times since its passage in 1872. The most important amendments are as follows:

The Mineral Lands Leasing Act of 1920 removed oil, gas, coal, sodium, potash, oil shale, and phosphate from the provisions of the Mining Law and made them leasable minerals. Geothermal energy was added as a leasable mineral in 1970.

The Surface Resources Act of 1955 removed sand, gravel, cinders, and other construction materials from the provisions of the Mining Law and made them subject only to contract sales. This act also made all mining claims subject to the right of the United States to manage the surface resources on the claims and made it illegal to use and occupy a mining claim or site except for legitimate mining, milling, or exploration purposes.

In the **Federal Land Policy and Management Act of 1976 (FLPMA)** Congress established a national-level recording system for all mining claims and required that in managing the public lands the Secretary of the Interior shall, by regulation or otherwise, take any action needed to prevent *unnecessary or undue degradation* of the lands. FLPMA also requires the Secretary to develop and maintain land use plans for the public lands. One purpose of land use plans is to select areas to be withdrawn from operation of the mining laws.

Several other acts shape BLM's management of minerals on public land. These acts include the **1970 Mining and Mineral Policy Act and the 1980 National Materials and Minerals Policy Research and Development Act**, both of which require that the public lands be managed to recognize the Nation's need for domestic sources of mineral production.

In addition, a variety of state and federal environmental laws regulate locatable mineral activities. The federal and state laws on air and water quality, wildlife, and hazardous materials apply to all operations conducted on BLM-managed lands. States have passed their own permitting and reclamation laws, which apply to activities on public lands in addition to those required by BLM.

History of the Surface Management Regulations

BLM adopted the 3809 regulations in 1981 after completing a programmatic EIS (BLM 1980). The existing 3809 regulations are presented in Appendix A and described in Chapter 2. Briefly, these regulations classify surface disturbance into three categories: casual use, Notice, and Plan of Operations.

Casual use involves only negligible disturbance with hand tools and does not require the operator to notify BLM.

Notice-level operations use mechanized earth-moving equipment and disturb 5 acres or less during any calendar year. For these operations BLM must be notified 15 calendar days in advance to ensure that the activity does not cause unnecessary or undue degradation.

A Plan of Operations is required for more than 5 acres a calendar year of surface disturbance or surface disturbance in one of BLM's special status areas, such as areas of critical environmental concern (ACECs). BLM must review and approve a Plan of Operations before an operation begins. Since approval of a Plan of Operations is a federal action, an environmental assessment (EA) or environmental impact statement (EIS) must be prepared. Reclamation bonding can be required only for a Plan of Operations under the existing regulations or for a Notice if the operator has been issued a record of noncompliance.

Since the original rules were issued in 1981, they have had several legal challenges. The factual basis for the regulations and the legal status of the Notice were the main issues in a 1986 suit filed by the Sierra Club. Issues raised included the adequacy of the 1980 EIS (BLM 1980) and whether a Notice was a federal action requiring a environmental review under

National Environmental Policy Act (NEPA) similar to a Plan of Operations. The Ninth Federal Circuit Court ruled, among other matters, that a Notice, as constructed in the 3809 regulations, was essentially an enforcement tool (to remind operators of their reclamation responsibilities), and enforcement actions were exempt from the requirements of NEPA. See *Sierra Club et al v Penfold et al*, 664 F. Supp. 1299 (District of Alaska, 1987); aff'm *Sierra Club v Penfold*, 857 F. 2d 1307 (9th Circuit, 1988).

Recent Studies and Changes to the Surface Management Program

When the regulations were published in 1981, BLM made a commitment to review their effectiveness after 3 years. In 1985 a BLM work group was formed to consider changes to the regulations relating to reclamation bonding. In 1989 BLM began a surface management initiative to make policy changes for cyanide use and compliance inspections in response to growing criticism of its managing of mining operations, particularly the issues of wildlife deaths, failure to perform reclamation, and residential occupancy not incident to mining. These issues were the subjects of reports prepared by the U.S. General Accounting Office (1986, 1987a,b, 1988, 1989, 1990, 1991a).

In 1992 a task force of BLM specialists collected public comments and recommended changes to the 3809 regulations (BLM 1992a). In 1993 this revision effort was put on hold because it appeared that pending changes in the Mining Law would supersede any changes in the surface management regulations.

Although these initiatives did not lead to overall revision of the 3809 regulations, the surface management program for implementing the regulations has undergone several important policy changes since 1981. A cyanide management policy was developed in 1990, and state-specific cyanide management plans were adopted to give guidance for managing cyanide use on public lands under the existing regulations. In 1992 the BLM *Solid Minerals Reclamation Handbook* (BLM 1992b) was completed to give guidance on reclamation practices. In 1996 BLM issued an Acid Rock Drainage Policy as guidance for program staff and managers for regulating mining. Also in 1996 BLM published the regulations at 43 CFR 3715 on occupancy of mining claims.

In early 1997 BLM revised the 3809 regulations for reclamation bonding. These changes were intended to address some of the problems BLM was experiencing in maintaining adequate reclamation bonds and improving its enforcement program. But the 1997 regulations were challenged in court by the Northwest Mining Association for failure to follow the requirements of the Regulatory Flexibility Act in relation to assessing the effects on small entities. In May 1998 the District Court ruled against BLM, and the 1997 regulation revision is no longer in effect (*Northwest Mining Association v. Babbitt*, No. 97-1013, D.D.C. May 13, 1998).

Scoping

In January 1997 the Secretary of the Interior directed BLM to restart the regulatory review process promised in 1981 and again in 1992. In March 1997 BLM appointed a task force of agency staff experienced in the program to coordinate public involvement, develop regulation options, and oversee preparation of a programmatic environmental impact statement (EIS) on the effect of any changes in the regulations.

Because of the time that had passed since the 1992 effort, BLM conducted an extensive public participation process starting in early 1997. From March through May 1997 BLM conducted briefings on the revision process for conservation and industry groups; congressional offices; the Western Governors' Association; and local, state, and federal government agencies. BLM also requested comments from its field offices on the adequacy of the existing regulations along with suggestions for improvement.

On April 4, 1997 a *Federal Register* notice announced preparation of the EIS, requested comments on the scope of the analysis in the EIS, and set forth a schedule for public scoping meetings. To collect a wide range of comments BLM arranged for public meetings to be held at a variety of locations across the country in the spring of 1997. (See Chapter 4, Consultation, Coordination, Public Participation, and Preparers.)

To establish a framework for the scoping process BLM presented the following list of topics, including those specified in the Secretary of the Interior's memorandum and others that had previously been named as program issues: (1) the definition of *unnecessary or undue degradation*, (2) the need to develop specific performance standards for mining and reclamation, (3) the 5-acre disturbance threshold between a Notice and a Plan of Operations, (4) the effectiveness of coordination among state and federal regulators, (5) the type and adequacy of penalties for violating the regulations, (6) the review time frames for Notices and Plans of Operations, (7) the definition of *casual use*, and (8) the requirements for reclamation bonding. Participants were also invited to comment on any other issues of concern with respect to the surface management program.

Scoping comments were formally accepted through June 23, 1997, although the record remains open until the final regulations are completed. In addition to oral comments at the public meetings, BLM received 1,832 comment letters on revising the 3809 regulations. A more detailed presentation of the comments received during scoping may be found in the September 1997 Scoping Report available from BLM (BLM 1997a).

Issues and Concerns

The scoping effort helped BLM determine the issues that needed to be considered in the rulemaking and EIS processes. These issues include the following.

Definition of *Unnecessary or Undue Degradation*

The Secretary of the Interior is charged with preventing "unnecessary or undue degradation" under the Federal Land Policy and Management Act. The current definition of "unnecessary or undue degradation" is set forth in the 3809 regulations. Whether the existing definition is adequate or should be expanded to include items such as the use of best available technology and practices (BAT) was the subject of a wide range of comments.

A large segment of industry and some agency staff assert that the existing definition of "unnecessary or undue degradation" is workable and flexible and should not be changed. Many commenters questioned exactly what was meant by BAT and were concerned that it would lock industry into "one-size-fits-all" design standards that ignore site-specific characteristics, fail to consider economics, and stifle innovation.

On the other hand, many commented that the current definition is too open to interpretation and, hence, abuse. They assert that a less subjective definition is needed, and that "prudent operator" and "usual, customary, and proficient" terms used in the existing regulations do not ensure the feasibility of control technology or would not adequately protect public land resources.

Comments were also received on setting a specific threshold for unnecessary or undue degradation on the basis of measured impacts (e.g. rills greater than 3-inches deep, any offsite impacts, impact greater than if BAT were used). Some commenters recommended the land use planning process to specify stated levels of protection for sensitive resources and to locally refine the definition of unnecessary or undue. Other commenters felt that the definition should include items such as prohibiting irreparable resource damage, require logical mineral development sequencing, and prohibit uses not reasonably incident to mining or milling.

Performance Standards for

Operations and Reclamation

The existing regulations include general performance standards such as prevent unnecessary or undue degradation and comply with all other environmental laws. Whether specific performance standards should be developed, and if they should be design based or outcome based, was the subject of comment.

Comments ranged from "do not have any standard other than preventing unnecessary or undue degradation" to "develop uniform national design standards for operations and reclamation." Many commenters were concerned that "one-size-fits-all" national standards would not be flexible enough to account for site-specific conditions. Other commenters did not think the current general industry standards were an acceptable minimum for public lands. There was concern that BLM-developed standards would conflict with standards used by states with primacy under the Clean Water Act. Many felt that if standards were developed, they should be outcome-based performance standards rather than having a certain design or technology mandated by BLM.

Comments on the standards for pit backfilling varied. Some felt backfilling should always be required to bring the land surface back to premining conditions. Others noted that pit backfilling would make many mines uneconomic and was not viable in all cases. Several noted that pit backfilling can actually create greater environmental impacts then leaving the pits open after mine closure. Others argued that water quality in postmining pit lakes poses a potentially permanent hazard.

Definition of Federal Lands

The existing 3809 regulations apply only to BLM-managed surface where the mineral estate is subject to the mining laws. In certain situations under the current requirements at 43 CFR 3814, BLM does process Plans of Operations and administer bonding on behalf of the surface owner where the surface is privately owned and the minerals are federally owned. This situation generally applies to lands patented under the Stock Raising Homestead Act, where the government reserved the locatable minerals. Some commented that the 3809 regulations should apply to these lands. Another comment was that regulations were needed on lands where BLM manages only the surface but the mineral estate is held in private or state ownership. According to this comment the 3809 regulations are best suited for this situation because they were formulated to address the private development rights of mining claimants.

The Threshold for a Notice or Plan of Operations

At present most operations that disturb less than 5 acres during any calendar year are conducted under a Notice and do not require BLM's approval. Operations that will disturb more than 5 acres need a Plan of Operations, review under the National Environmental Policy Act, and BLM's formal approval. Comments varied from raising the threshold and having more Notices to eliminating the Notice provision entirely and requiring all activity (greater than casual use) to have an approved Plan of Operations. Various acreage thresholds were proposed. Other suggestions proposed basing the threshold on impacts instead of acreage, or on the type of activity by retaining Notices only for exploration and requiring Plans of Operations for mining.

Secretary Babbitt also directed BLM to analyze impacts of adopting the Forest Service threshold of significant disturbance for a Plan of Operations. Concern was expressed about the amount of time BLM would take to process a large increase in the number of Plans of Operations and the increased workload that would result from making Notices federal actions under the National Environmental Policy Act.

Definition of Casual Use

Casual use refers to activities causing

negligible surface disturbance where BLM does not have to be notified and neither a Notice nor a Plan of Operations is required. Comments on clarifying the definition of casual use focused on such topics as the acceptable size (if any) of a portable suction dredge, the use of explosives or earth-moving equipment, underground mining, and the impacts of recreational mining. Comments varied from stating that any activity producing a salable commodity was not casual use to casual use should allow up to 1 acre of disturbance. Commenters gave examples of environmental degradation caused by the cumulative impacts of casual use, such as concentrated weekend mining by recreational groups.

Notice and Plan of Operations Processing and Contents

Comments were received on the amount of time BLM takes to process Notices and Plans and what amount of time is suitable. Many commenters felt that the current Notice time frame of 15 calendar days is too short and suggested more review time to assure that resources are adequately protected. Comments on Plans of Operations criticized the excessive time (years) needed to get through the National Environmental Policy Act process or some other statutory review and that few Plans can be approved in 90 days if impacts are controversial or significant.

Some commenters requested that the review process be speeded up, whereas others wanted it slowed down to allow more public involvement. An automatic approval provision was recommended for cases in which BLM would fail to meet review time frames. It was suggested that the problem is not with the time frames themselves but with the low agency staffing levels and budget. Commenters suggested that BLM specify that a "complete" Plan or Notice must be received before the start of any time frame and that a completeness process be developed in the regulations.

State Government Coordination

Because most states have reclamation laws with environmental permitting requirements that also apply on BLM lands, coordination between BLM and state regulatory agencies is essential. Comments tended to be divided over who should develop the regulations for BLM lands. Some commented that consistent nationwide federal rules are needed to provide a minimum standard and that BLM must retain primacy on public lands. Others commented that current state programs are adequate and more suitable for local conditions and that BLM should not duplicate them. Commenters also suggested that BLM "certify" state programs for the public lands and retain oversight.

Claim Validity and Valid Existing Rights

Some comments recommended that to prevent unnecessary or undue degradation and mining scams BLM should determine if an economic deposit exists before permitting operations. Others commented that BLM should conduct claim validity exams on all lands before accepting a Notice or approving a Plan of Operations, or that BLM should conduct validity exams on claims in withdrawn areas or special management areas before allowing mining.

Common Variety Minerals

A current problem is that Notices or Plans of Operations are filed for mining of material that may not be locatable under the Mining Law and such minerals should instead be sold as common variety materials. The present policy is to process the 3809 action and collect potential royalties in escrow while a determination is made on the locatable versus salable nature of the material. Comments recommended that this procedure be included in the 3809 regulations or that some other procedure be devised to address this issue.

Inspection and Monitoring Programs

BLM inspects operations to determine if operators are complying with the regulations. But particularly on large projects, operators are responsible for conducting the routine environmental monitoring and reporting the results. Comments suggested that the regulations should mandate a set inspection frequency by BLM, require the operator to hire independent outside consultants to conduct environmental monitoring, and allow citizens to accompany BLM on inspections. Other comments said that self-monitoring was acceptable if BLM verified the results and that the frequency of inspections should be based on the individual risk of the operations and should not be specified in the regulations.

Type and Adequacy of Penalties for Noncompliance

The issue of penalties for noncompliance was presented to the public because the current system does not include administrative penalties but relies on filing complaints in federal court. Comments on this issue varied from those who felt that BLM should stay away from any penalty system to those who favored stronger penalties and permit revocations for noncompliance. Some industry representatives favored an intermediate administrative penalty system and process as a way of resolving cases before court proceedings begin. Several related issues arose during scoping. Among these were using compliance history as a basis for future permit decisions, revoking mining claims or permits for noncompliance, and blocking future permits for noncompliance.

Reclamation Bonding Requirements

The regulations published in February 1997 required some form of financial assurance to ensure reclamation for all Notice- and Plan-level operations. In May 1998 these regulations were remanded to BLM and are no longer in effect. As part of the overall revision of the 3809 regulations, BLM asked for more comments on this issue. One major comment suggested eliminating the requirement in the 1997 version for bond cost estimates to be certified by a third- party registered professional engineer. Some commenters wanted the bonding requirement eliminated, or eliminated for Notice-level disturbance or small mines. Others wanted all surface disturbance, regardless of size, to be fully bonded for reclamation. Still others commented that the bond amount should be expanded from covering just the reclamation costs to include the possible costs of an accidental spill, release, or structural failure. BLM's administering of a nationwide bonding pool was suggested as a way to provide bonding for small operators. Comments suggested that bonds need to be held for years past mine closure in certain areas to ensure reclamation success and that public notification and comment should be obtained on the bond amount and before bond release.

Appeals Process

Under the existing regulations, operators can appeal to the BLM state director and then to the Interior Board of Land Appeals (IBLA). Parties other than operators must appeal directly to IBLA. Decisions are in full force and effect during an appeal unless a written request for a stay is granted. Several comments were made on the appeals process. One comment suggested that, upon appeal, the decisions of the authorized officer should be automatically stayed (put on hold) until the appeal has been fully considered. Another comment was that the appeals process for operators and third parties should be the same.

Definition of Project Area

The current definition of a project area is a single tract of land upon which operations are conducted and one or more mining claims have been filed under one ownership. Some comments stated that the definition should allow for multiple claim ownership where a single operator is mining. Other comments stated that a project area should include underground mining beneath BLM lands and support facilities not on the claims, and that a permit or project area boundary should be specified to define individual project areas.

Existing Operations

If the regulations are changed, the question of how they would apply to existing or pending operations must be addressed. Comments differed from exempting existing operations to giving existing operations a set period of time to comply with any new requirements.

Issues and Concerns Not Addressed

The following issues were raised but are not within the scope of the 3809 regulations and are not specifically addressed through this rulemaking process or used to develop alternatives in the EIS.

The 1872 Mining Law

The issues of patenting of mining claims and lack of royalties on mineral production are outside the scope of the surface management regulations. These provisions are part of the ongoing national debate over the Mining Law and are best addressed through congressional action.

American Indian Trust Responsibilities

Commenters stated that mining has affected American Indian lands, resources, and people, and that the 3809 regulations should be written to preclude activities with those impacts. Also raised were related issues that the public lands are important to American Indians for their traditional cultural values, that these lands are not being protected from mining by the 3809 process, and that these types of impacts violate the Executive Order on Environmental Justice.

These issues are commonly raised for many activities on public lands and are larger in scope than the 3809 regulations. The 3809 regulations are not used to review or approve mining on Indian lands. BLM's American Indian trust responsibilities are defined through legislation, executive order, and Department of the Interior policy, regardless of the type of activity or degree of specificity in regulations. To maintain consistency in how BLM executes its trust responsibilities, this EIS will not consider alternatives that would establish separate trust responsibilities specific to mining. But as part of its impact analysis, this EIS still addresses the effect of the alternatives on American Indian social, cultural, and religious concerns.

Citizen Suits

Scoping comments requested that the 3809 regulations incorporate "citizen suit" provisions to allow citizens to file suits to enforce the regulations. The emphasis of these comments was that citizens need to gain access to mining projects and see firsthand the inspections that are being conducted because BLM is not promptly responding to citizen complaints. Provisions for citizens to accompany inspectors is within the scope of the regulations and has been included in the alternatives discussion. But establishing a citizen suit provision is not provided for by the underlying authority (Federal Land Policy and Management Act) and is outside the scope of the regulations to address.

BLM Cost Recovery

Comments suggested that BLM require

recovery of some or all of its administrative costs from the mineral operators as a way of funding the program. The issue of cost recovery is broader in scope than the 3809 regulations. Cost recovery may be addressed by a separate rulemaking for all programs, not just those related to locatable minerals.

Agency Funding and Staffing

Many comments noted that BLM does not have adequate funding and staffing to administer the program and that changes in the funding and staffing levels are the best way to address current problems. Aside from certain cost recovery provisions (see above), agency funding and staffing levels cannot be established through regulations but are subject to congressional appropriation. This issue is outside the scope of the regulations to resolve. This EIS, however, does address relative workload costs for each alternative.

National Environmental Policy Act Processing of Plans of Operations

Comments on how to conduct environmental review (environmental assessments or EISs) for Plans of Operations were received during scoping. Comments were made on how to conduct cumulative impact analysis, evaluate mitigating measures, and establish EIS consultant qualifications. The Council on Environmental Quality regulations at 40 CFR 1500 give requirements for implementing the National Environmental Policy Act. Guidance on how to conduct environmental analysis for mining is more suitably developed through agency manuals or handbooks than by regulation because of the evolving techniques in impact analysis and rapid technological developments in reclamation and mitigation.

Abandoned Mine Lands

One comment stated that BLM lacks a consistent, nationwide review and approval process for abandoned mine land projects and that BLM should use the review process and performance standards in the 3809 regulations to review its own abandoned mine land projects. This issue is not considered to be within the scope of the 3809 regulations. The technical requirements and capabilities of new or active mines under the 3809 regulations greatly differ from those of historic abandoned mines (that predate most environmental regulations). The issue of a consistent review and approval process for abandoned mine lands projects will be forwarded to BLM's Abandoned Mine Lands Task Force for its consideration.

Diligent Development

Some comments noted that Notice- or Plan-level operations often sit idle for many years with only minimal work and that a diligence requirement should be included in the regulations. Requiring diligent mineral development as a prerequisite to maintaining mining claims is not considered within the scope of the 3809 regulations because the mining laws mention no time frame for mineral extraction, focusing instead on assessment work and claim maintenance fees. The related issue of diligent reclamation and operations under Notices and Plans, however, has been included under time frames for Notices and Plans of Operations.

Recreational Mining

Commenters stated that recreational mining was not intended under the mining laws since it did not result in commercial production. Establishing separate requirements to determine if a person is engaged in hobby-level versus commercial mining is not considered within the scope of the 3809 regulations. This determination would involve evaluating the economics of hobbyists working in areas that are open to recreational use anyway. Rather, the environmental effects of such concentrated activity will be considered under the issue of the definition of "casual use" and options considered for determining at what level of activity a Notice or a Plan of Operations should be required.

Public Availability of Information

Some comments suggested that all mine records be open for public review and that companies have to disclose information on company finances, corporate officers, partners, directors, and compliance history. Much of this information may already be obtained from other government agencies such as the Securities and Exchange Commission. Most project-specific information that BLM receives may be obtained under the Freedom of Information Act, which applies to all BLM programs. A need for public disclosure requirements beyond existing authorities has not been recognized.

Combining 3809 Regulations with Occupancy Regulations

One comment suggested that BLM combine the 43 CFR 3715 regulations for mining claim occupancy with the 3809 regulations. The procedures for addressing occupancy are already in place and functioning. This issue has just recently been addressed through regulation. A cross-reference with the 3715 regulations has been proposed to maintain consistency.

Consistency with the Forest Service Regulations

Some commenters requested that BLM and the Forest Service both change their surface management regulations at the same time to promote consistency. Others said that BLM should not try to parallel Forest Service regulations. A joint revision effort requires Forest Service action. It is beyond BLM's authority to change any of the surface management requirements for operations on lands administered by the Forest Service or to require the Forest Service to revise its regulations concurrently with BLM. The proposed regulations do consider adopting a threshold between a Notice and a Plan of Operations similar to current Forest Service regulations.

Chapter 2
Proposed Action and Alternatives

Significant Issues

The purpose of the alternatives is to allow the decisionmaker to consider ways to address and resolve issues recognized during the scoping process. The resolution of significant issues forms the framework of an alternative, with the resolution of lesser issues included around the alternative's central theme. This section describes how those significant issues led to the developing of the alternatives.

The development of alternatives centered on addressing regulatory issues in five general areas: (1) coordination between BLM and state regulatory agencies, (2) the Notice-Plan of Operations threshold, (3) defining performance standards, (4) financial assurance for performance of reclamation, and (5) regulation enforcement and penalties for noncompliance. Although other relevant issues were considered, these significant issues played a major role in defining the alternatives to be analyzed in detail.

State-Federal Coordination

A significant issue consists of maintaining and improving coordination between the states and BLM and determining the relative level of responsibility for regulating mineral exploration and development. Alternatives developed to address this issue range from turning the program entirely over to state regulation to having BLM always assume the lead role for regulating activities on public lands.

Some states and many industry representatives commented that the existing state-federal programs are adequate to regulate mining and that the existing regulations provide for the proper level of coordination needed to eliminate duplication. This position is reflected in Alternative 1, which would maintain the existing regulations.

Others commented that BLM regulation is redundant and not needed. Alternative 2 was developed to address these concerns. Alternative 2 would place the sole responsibility for day-to-day regulation on the states, and BLM's role in regulation would be reduced to periodic general oversight. The Federal Land Policy and Management Act's requirement of preventing unnecessary or undue degradation would be met by state programs.

Alternative 3 was designed to give the option of deferring to state requirements for some, possibly large, portions of regulations while maintaining BLM concurrence authority on individual projects. This alternative would allow states to take the lead whenever possible yet maintain BLM's ability to regulate individual projects.

Some commenters expressed concern that anything less than a program of complete federal regulation of operations on federal lands would not adequately protect the environment. Alternative 4 addresses this concern with regulations that require BLM to play the lead role in all aspects of mining regulation on public lands. Though state regulations would still apply under this alternative, corresponding federal regulations would be at least as stringent and would guide the activity with design-based standards.

Notice or Plan of Operations (Plan) Threshold

The 5-acre threshold between a Notice and a Plan of Operations in the existing regulations is described in the discussion of Alternative 1 in this chapter. Briefly, a Notice is required for surface disturbance of 5 acres or less during a calendar year, whereas a Plan of Operations is required for disturbance of more than 5 acres in a calendar year, or disturbance of any size exceeding casual use and occurring on special status areas. BLM received a wide range of comments on this threshold. Some commenters wanted the threshold left as it currently exists. Alternative 1 would not change the threshold and addresses this comment. Some commented that the requirements to file a Notice or Plan duplicated the filing requirements under state regulatory programs and were not needed. Eliminating the BLM filing and review requirements was included in Alternative 2 to address this issue.

Alternative 3 responds to a range of comments that the current 5-acre Notice threshold is not always suitable. Alternative 3 maintains the Notice provision but expands the list of sensitive and special status areas where a Notice cannot be filed and operations greater than casual use must file a Plan of Operations. This alternative also requires a Plan for operations where chemicals will be used or where the potential for acid rock drainage exists. The Secretary of the Interior requested that BLM consider using the Forest Service approach as one option. That approach is an option within the proposed regulations under Alternative 3. Therefore, Alternative 3 contains two options for changing the Notice/Plan threshold: expanding the list of situations where a Notice would not be accepted or using the Forest Service approach of requiring a Plan of Operations for exploration or mining that would cause significant surface disturbance as determined on a case-by-case basis. The final EIS will include only one of these options.

Some commenters were concerned that allowing operations to be conducted under a Notice would never be suitable because no National Environmental Policy Act review or opportunity for public involvement would be required. Alternative 4 addresses that concern by eliminating the Notice provision and requiring Plans of Operations for any surface disturbance exceeding casual use.

Performance Standards

An important part of the 3809 regulations consist of the standards that govern how operators must control the extent of impacts on the ground. Alternatives were developed to address comments on (1) the environmental resources for which standards should be developed, (2) whether those standards should be design or outcome oriented, and (3) the level of environmental protection the standards should give. Although other combinations of standards could have been developed and analyzed, the alternatives selected for analysis provide a reasonable representative range of impacts to help agency decisionmakers. Every alternative includes compliance with other state or federal laws and regulations as a minimum performance standard.

Alternative 1 includes the existing performance standards and addresses comments that the existing regulations are adequate and that the regulations should contain minimum standards with details developed on an individual project basis or through policy guidance as needed to prevent unnecessary or undue degradation.

Alternative 2 contains no BLM performance standards but relies on state environmental regulations and other federal environmental protection requirements. This alternative addresses the comments that BLM performance standards are not needed because other state or federal requirements are adequate to protect the environment. State requirements vary from general outcome-based standards to prescriptive design standards, depending on the state program.

Alternative 3 proposes outcome-based BLM standards. These standards address the issue that, in addition to the state and other federal standards, BLM should have its own performance standards for operations on public lands. The proposed standards are written to focus on performance and outcome, with minimum direction on design or required technology. This approach addresses comments that BLM should not develop one-size-fits-all design standards but allow for site-specific environmental conditions, promote innovation, and focus regulation on the end-performance result.

The Alternative 3 standards incorporate existing policy and practices into a comprehensive set of regulations that provide more consistency. Alternative 3 addresses the issue that BLM should consider ways to balance environmental protection with mineral development and not increase the regulatory burden on operators. Alternative 3 also addresses comments by operators that BLM offices vary too much in applying existing regulations and policies.

Alternative 4 proposes standards that would address two common comments: the need for increased environmental protection from mining and the need for minimum national design standards for exploration, mining, and reclamation. The performance standards in this alternative would require more stringent levels of environmental protection, coupled with design requirements to attain those stated levels of protection.

Financial Assurance (Bonding)

The adequacy of financial assurance requirements, generally referred to as bonding, and what these requirements should cover were the subject of several comments. Typically bonding is required as a compliance tool to ensure that the required reclamation is performed should the operator be unable or unwilling to do so. With the recent district court case on BLM's 1997 bonding regulations, the issue of reclamation bonding is even more relevant today than when the regulation revision process began. Alternatives for addressing the issue of bonding have been developed in response to comments.

Alternative 1 uses the existing regulations (those in effect before the February 1997 revisions) that give BLM the discretion to require reclamation bonding for Plan-level operations, with no set minimum or limit on the amount. Notice-level operations are not bonded. Alternative 1 addresses the comments that bonds be held for larger operations or for operations in sensitive areas, where the risk is greatest. At the same time Alternative 1 addresses the comment that small mine operators or persons engaged in exploration should be exempt from the bonding requirements because of the burden that bonding is to the small operator and the limited amount of surface that small operations would disturb.

Alternative 2 provides for no reclamation bonding by BLM. Financial assurances would be required according to state requirements. This provision addresses the comment that bonding by BLM duplicates most bonding required under state programs and is not needed.

Alternative 3 requires bonding at the actual cost of the reclamation for all Notice- and Plan-level operations and would allow the public to comment on bond amounts and before final release. Bonding would include costs for interim stabilization and for post-reclamation treatment or maintenance such as water treatment, safety berms, and fencing. This provision addresses the comment that all disturbances, no matter what size, should be fully bonded to protect the public. Alternative 3 allows states to administer the bonding program to address the comment that BLM bonding duplicates state requirements and may be an unneeded burden on operators. BLM, however, would have to agree to the bond amount and release.

Alternative 4 also requires that all operations be fully bonded for reclamation, but further requires that additional bond be posted for cleanup or remediation of unplanned events such as spills or failures. Alternative 4 addresses the comment that bonding just for nonperformance of reclamation is not adequate, but that bonding should be used to correct environmental damage from unplanned events.

Enforcement and Penalties

Alternative 1 provides administrative procedures, such as notices of noncompliance and possible court action, for unresolved noncompliance, responding to the comment that enforcement is not a large problem, BLM does not need new regulations, and existing problems can be handled by the states.

Alternative 2 addresses the comments that BLM should leave most enforcement actions up to the states, eliminating a potentially duplicative process.

Alternative 3 would give BLM more enforcement tools, such as suspension and revocation authority and discretionary administrative penalties. This provision addresses two comments: (1) BLM needs its own enforcement program for public lands rather than having to rely on going directly to court and (2) a federal program is needed because some states are not always pursuing enforcement actions.

Alternative 4 provides even greater enforcement provisions than Alternative 3 by making administrative penalties mandatory, not subject to agency discretion, and by establishing permit blocks for noncompliance. This provision responds to those who feel that state enforcement programs are not strong enough and want a federal enforcement program.

Regulations Common to all Alternatives

Under all alternatives, national environmental protection laws and regulations will generally apply to activities conducted on BLM-managed lands under the Mining Law. In addition, although local and state governments cannot impose land use planning or zoning restrictions on a federal land use such as mining, they can regulate how mining activities are conducted. All of the western states have developed mining regulations for activities on BLM-managed lands. As a result, mineral exploration and development are subject to compliance with a variety of local, state, and federal environmental laws and regulations independent of any requirements imposed by the 3809 regulations. For example, major environmental laws such as the Clean Water Act, the Clean Air Act, the Endangered Species Act, the Migratory Bird Treaty Act, the Resource Conservation and Recovery Act, and the Archaeological Resources Protection Act apply to mineral activities under all of the alternatives.

Appendix C lists major federal laws and Appendix D discusses state programs that govern mineral projects under all alternatives. It is upon this backdrop of other existing laws, regulations, and programs that alternatives for applying BLM's 3809 regulations are considered.

Description of the Alternatives

This section describes in detail the four alternatives (including the Proposed Action and the No Action alternatives) that are considered in this EIS. Alternative 1 (Existing Regulations, No Action) would have BLM continue to use the existing 3809 regulations. Alternative 2 (State Management) would remove BLM from routine regulation of mineral activities and rely exclusively on the state programs to regulate mineral activities on BLM-managed lands. Alternative 3 (Proposed Action) contains BLM's proposed regulations that constitute the Proposed Action and BLM's Preferred Alternative. Alternative 4 (Maximum Protection) would increase the level of environmental protection and impose a design-oriented regulatory approach led by BLM.

The four alternatives are described below in detail. Specific regulation language has not been drafted for Alternatives 2 or 4. Should either alternative be selected for implementation, draft regulations would be prepared to incorporate the concepts of the alternative. Following the detailed alternative descriptions are two summary tables (Tables 2-1 and 2-2) that compare the major provisions of each alternative.

Alternative 1: Existing Regulations (No Action)

Under Alternative 1 the existing surface management regulations at 43 CFR 3809 (Appendix A) would continue to be used, and no changes would be made. These are essentially the same regulations that have been in effect since 1981. Over the years BLM has developed policy documents, manuals, and handbooks that provide guidance on how the regulations are to be implemented. The following is a description of the existing regulations by major provision, along with a discussion of how the program is being implemented by BLM field offices.

Unnecessary or Undue Degradation Definition

The existing regulations require the operator to prevent *unnecessary or undue degradation* of the public lands. Unnecessary or undue degradation, as defined in the existing regulations, requires that the operator (1) create no surface disturbance greater than what would normally result from a prudent operator's accomplishing the activity; (2) consider the effects of operations on other resources and land uses; (3) begin and complete reasonable mitigating measures, including the reclaiming of disturbed areas; (4) not create a nuisance; and (5) comply with environmental statutes and regulations.

Unnecessary or undue degradation (1) recognizes that locatable mineral activities cause environmental impacts and (2) seeks to keep those impacts at the minimal level needed for the operator to conduct activities as authorized under the mining laws.

Project Area Definition

The existing regulations define a project area as a single tract of land upon which operations are conducted. The project area includes disturbance from building or maintaining roads, transmission lines, pipelines, or other means of access. The definition specifies that the project area may include one or more mining claims under the same ownership. In practice, however, the project area often includes claims under multiple ownerships or may involve no claims if the land is open to activity under the mining law. BLM uses the working definition that the project area is the contiguous part of the same operation under the operator's control and includes disturbance for support facilities such as access roads, powerlines, or pipelines.

Public Lands/Federal Lands Definition

The definition of public lands is important in that it determines to what lands the 3809 regulations apply. The existing regulations apply only to BLM-administered surface where the underlying mineral estate is subject to operations under the Mining Law. The existing regulations do not apply to lands where only the mineral estate is federal and the surface estate is privately owned, such as lands patented under the Stock Raising Homestead Act. Nor do the regulations apply to land whose surface estate is managed by BLM but whose mineral estate is privately owned. Locatable mineral activities on wilderness study areas (WSAs) administered by BLM are not regulated under the 3809 regulations but by subpart 3802, which is not part of this rulemaking.

Often locatable mineral operations occur on a mixture of private lands and BLM-administered lands. In these cases the 3809 regulations apply only to activities on the public lands. But if any associated environmental analysis is conducted under the National Environmental Policy Act, the analysis must consider the environmental impacts of the BLM approval on all lands, regardless of ownership.

Disturbance Categories and Thresholds

The existing 3809 regulations are based on three administrative classifications of surface-disturbing activities on public lands: casual use, Notices, and Plans of Operations.

Casual Use. Casual use refers to activities that only negligibly disturb public lands and resources. Casual use generally does not include the use of mechanized earth-moving equipment, explosives, or motorized equipment in areas closed to off-road vehicles. Some BLM field offices have considered the use of small suction dredges or portable drills to be casual use.

Operators engaged in casual use do not have to notify BLM of their activities, and BLM does not have to approve their operations. Casual use operations, however, are subject to monitoring by BLM to ensure that unnecessary or undue degradation does not occur. Disturbance created under casual use must still be reclaimed.

Notices. Activities that exceed casual use but disturb 5 acres or less during any calender year can be conducted under a Notice unless special status areas are involved. A Notice is often used for exploration involving road building or drilling. Small mines can also operate under Notices. Notice-level activities may begin after a brief review by BLM for potential resource conflicts that would result in unnecessary or undue degradation. All disturbance created under Notices must be reclaimed. No more than 5 acres may remain unreclaimed at any given time, or the operator must obtain an approved Plan of Operations. Variations exist among BLM offices as to when reclamation is considered complete for purposes of determining acreage. One interpretation is that acres that have been graded and seeded are not counted, whereas other offices require the reestablishment of a vegetative cover for those acres not to be counted.

Plans of Operations. An approved Plan of Operations is required for surface disturbance that exceeds 5 acres, or for any surface-disturbing activity exceeding casual use in special status areas such as the California Desert Conservation Area, areas within or potential additions to the National Wild and Scenic Rivers System, areas of critical environmental concern, BLM-administered areas in the National Wilderness Preservation System, or areas "closed" to off-road vehicle use.

Claim Validity and Valid Existing Rights

Mining claim validity is not addressed in the existing 3809 regulations. In fact, the Mining Law does not require operators to have a mining claim or mill site before conducting operations on BLM lands. If the lands are open to locatable mineral activity under the Mining Law, operators do not need a mining claim to conduct operations.

On lands that are segregated or withdrawn from locatable mineral activity under the Mining Law, only in wilderness areas do the regulations (43 CFR 8560) require that mining claims be examined for validity before BLM approves a Plan of Operations. In other segregated or withdrawn areas BLM can conduct validity examinations before processing a Notice or approving a Plan, but the time needed to complete the exam exceeds the 15-day Notice review time frame and would probably exceed the time needed for review and approval of a Plan of Operations. BLM can withhold authorization for Plans if reasonable doubt exists as to the claim's validity.

Common Variety Minerals

Whether the mineral to be mined under a Notice or Plan is locatable under the Mining Law or saleable under the Materials Sales Act may be disputed. This situation is not specifically addressed in the existing 3809 regulations. The existing regulations (43 CFR 3610) prohibit the sale of mineral materials from mining claims even with agreement by the mining claimant.

The working policy has been to process the Notice or Plan of Operations under the 3809 regulations and to establish an escrow account in which the operator has to deposit monies representing potential fair market value should the mined material be found not to be locatable and such monies are owed the government. Upon completion of a common varieties determination (often a lengthy process) the escrowed royalty from ongoing operations is either returned to the operator or paid to the government. If the mineral is determined to be of common variety, the 3809 authorization is then converted to a material sale contract.

State-Federal Coordination

The existing 3809 regulations state that the rules do not preempt state laws and regulations governing operations on federal lands. The most protective regulatory provision usually applies. Appendix D summarizes state regulatory programs.

The existing regulations also allow BLM to enter into agreements with the states for joint regulatory program administration to prevent unnecessary or undue degradation and to eliminate duplication. The agreements can, wherever possible, allow state administration and enforcement of the program.

Under the existing regulations BLM has developed joint agreements or memorandums of understanding for regulating operations in all of the western states except Arizona. Arizona and BLM are working on developing an agreement.

In states with laws similar to the National Environmental Policy Act (NEPA)—California and Montana—BLM has based decisions on the environmental analysis prepared under both state and federal laws in consultation with state regulatory agencies. In other states that do not have statutes analogous to NEPA, BLM invites state and local agencies to participate in preparing environmental assessments and EISs, often designating state and local agencies as formal cooperating agencies.

Existing Operations

When the existing regulations went into effect in 1981 operations in existence at the time were allowed to continue but were required to file either a Notice or a Plan of Operations depending on the size of disturbance. Notice-level operations were required to file a Notice within 30 of the effective date of the regulations. Operators required to file a Plan of Operations had to do so within 120 days but could obtain an extension of 180 more days. All operators who were required to file in 1981 have either done so or are no longer active.

Notice and Plan of Operations Content and Processing

Notices. No special form is required for a Notice, but a Notice must adequately describe the activity that would occur and state that all disturbed areas will be reclaimed to the standards of the regulations. The operator must give the Notice to BLM at least 15 calendar days before beginning activity. BLM must complete its review of the Notice within 15 calendar days of receiving the complete Notice.

BLM's review of a Notice is not a federal action, so no environmental documentation must be prepared under the requirements of NEPA. But a Notice is reviewed by a variety of BLM specialists to determine if the operation would cause unnecessary or undue degradation. The BLM minerals specialist reviews the Notice to ensure that it is complete and that a Plan of Operations is not needed. After the initial review, other resource specialists complete an interdisciplinary review of the Notice for potential resource conflicts that would cause unnecessary or undue degradation.

The standards for reviewing Notices under the existing regulations and policy are as follows:

1. Access routes must be planned for only the minimum width needed for operations and must follow natural contours, where practicable, to minimize cuts and fills.
2. All tailings, dumps, and deleterious substances and other waste produced by the operations must be disposed of to prevent unnecessary or undue degradation.
3. At the earliest feasible time, the operator must reclaim the area disturbed by taking reasonable measures to prevent or control on- and off-site damage to public lands.
4. Reclamation must include saving topsoil to apply to the land's surface after disturbed areas have been reshaped; taking measures to control erosion, landslides, and water runoff and to locate, control, and remove toxic

materials; reshaping the disturbed area; applying topsoil; revegetating disturbed areas; and rehabilitating fisheries and wildlife habitat.

Other items that are reviewed include verifying the land status; checking that the area is open to the Mining Law; determining whether the operation would disturb 5 acres or less during a calendar year; determining if the proposal covers the same ground as previous operations under another Notice; recognizing potential conflicts with threatened or endangered species or cultural or paleontological resources; and recognizing any potential compliance problems with state and federal laws. Often BLM conducts a field inspection of the project area with the operator so that areas of concern can be recognized and addressed before disturbance.

Once the Notice has been reviewed, the operator is notified that unnecessary or undue degradation of public lands would or would not occur. This notification includes any changes or recommendations the operator needs to follow to prevent unnecessary or undue degradation and a statement reminding the operator that a final inspection of the reclaimed area is required.

Plans of Operations. No special form is required for filing Plans of Operations. The operator must submit information, such as operator name and mailing address, map or sketch of the operation, and enough information to describe the proposed operation and the reclamation measures to be used. BLM has 30 days to review a Plan of Operation and either approve it or advise the operator (1) of any other information needed to evaluate the plan, (2) of measures required to prevent unnecessary or undue degradation, or (3) that more time, not to exceed 60 days, is needed for BLM to review the project. If an EIS, Section 7 consultation under the Endangered Species Act, or Section 106 compliance under the National Historic Preservation Act is needed, the review time is not limited.

A decision on a Plan of Operations is a federal action requiring analysis under the National Environmental Policy Act (NEPA). The environmental analysis may be accomplished by several means. An environmental assessment (EA) or an EIS is the most common document prepared for approval of new or modified plans of operations. The EA is used to determine if the operations would significantly affect the environment. If no significant impacts are found, a finding of no significant impacts and decision record (FONSI/DR) are prepared, and BLM approves the project.

Operations that would cause significant impacts require preparation of an EIS. (More guidance on elements that could trigger an EIS can be found in Department of the Interior Manual 516 DM 6, Appendix 5.) A draft EIS is prepared to disclose potential impacts and consider mitigation measures. This document is then reviewed by the public and other agencies. After a final EIS is written, a record of decision (ROD) is prepared, subject to requirements needed to prevent unnecessary or undue degradation. The amount of time to prepare an EA or EIS and approve a Plan is determined by the complexity of issues and expected impacts of the project. Time frames can be as short as several days or extend for more than 5 years for large projects.

The technical issues involved in the approval of a Plan of Operations for large open pit and underground mines have become increasingly complicated. BLM has adopted policies to address issues such as pit lake water quality, acid rock drainage, cyanide use, migratory bird deaths, reclamation and chemical closure, and mine dewatering. To standardize methods for addressing these issues BLM has developed the Acid Rock Drainage Policy, Cyanide Management Policy, and BLM Reclamation Handbook. In addition, nonmining surface use occupancy issues were addressed in the 43 CFR 3715 Surface Occupancy Regulations. BLM state offices such as Nevada have also adopted reclamation revegetation standards and a water resource policy to further define the national policy direction.

Plans of Operations can be modified by the operator or at BLM's request. A significant modification of an approved plan must be reviewed and approved in the same manner as the initial plan.

Performance Standards

General. The overall performance standard required by the existing regulations is to prevent unnecessary or undue degradation. To comply with this standard, operators must not cause impacts beyond those considered due and necessary; must reclaim disturbed land; and must comply with all local, state, or federal environmental laws and regulations. Specific requirements needed to prevent unnecessary or undue degradation are developed during individual project review.

Land Use Plans. The existing regulations do not address the relationship of exploration and mining to land use planning. Land use plans may provide information on resources requiring consideration by operators. Land use plans such as resource management plans are used to name special status areas that require a Plan of Operations instead of a Notice, such as in an area of critical environmental concern. The land use plan also determines where BLM would seek withdrawals of lands from operation of the Mining Law. But if the land is open to mineral entry, the existing 3809 regulations, not a particular land use plan, establish performance standards for operations.

Surface and Ground Water Protection. All operators must comply with federal and state water quality standards. National Pollution Discharge Elimination System (NPDES) permits are required from the Environmental Protection Agency (EPA) or a state-delegated authority by EPA for a discharge to surface water. In addition, some states require discharge permits for ground water.

Lakes that form in mine pits are generally not regulated under the NPDES system. In some states if the pit lake discharges to ground water, a permit may be required. BLM uses predictive modeling to estimate pit lake geochemistry and potential toxicity. Pit lakes found to be potentially toxic must be treated, eliminated, or restricted from access.

The existing regulations do not specify requirements for plugging drill holes. Field offices have been requiring plugging in response either to state requirements or to site-specific ground water concerns.

Wetlands and Riparian Area Protection. The existing regulations do not specify protection of wetland or riparian areas but require rehabilitation of wildlife and fisheries habitat. Rehabilitation of these habitats does add some protection to wetland and riparian areas. Section 404 permits, required by the Army Corps Engineers for dredging or filling in waters of the United States, provide for mitigating impacts to jurisdictional wetlands.

Soil or Growth Media Handling. The existing regulations require topsoil to be saved and reapplied to disturbed areas where reasonable and practicable after reshaping has been completed. The existing regulations do not specify requirements for segregating or preserving topsoil.

Revegetation Requirements. The existing regulations require revegetation of disturbed areas where reasonable and practicable. Revegetation must provide a diverse vegetative cover. Common practice is for most BLM field offices to review the operator's proposed seedmix. Revegetation is also a component of the requirement to rehabilitate wildlife habitat. The requirement in the definition of "unnecessary or undue degradation" not to create a nuisance is used to address noxious weed control.

Fish and Wildlife Protection and Habitat Restoration. The existing regulations require the operator to act to prevent adverse impacts to threatened or endangered species and their habitats that might be affected by operations. An unmitigatable impact to a threatened or endangered species is one of the few resource conflicts that can prevent a Plan of Operations from being approved or a Notice-level operation from proceeding.

The existing regulations require that reclamation include rehabilitation of fisheries and wildlife habitat. The regulations do not specify a time frame for achieving rehabilitation.

Protection of Cultural Resources. A Decision on a Plan of Operations is an undertaking requiring BLM to follow the process in Section 106 of the National Historic Preservation Act to develop mitigation for cultural resources recognized before a Plan is approved. Since a Notice is not a federal undertaking, the 106 process does not apply. But BLM field offices review Notices and often visit project areas, instructing operators on avoiding cultural resources.

The existing regulations state that operators cannot knowingly disturb, alter, injure, or destroy any historical or archaeological site, structure, building, object, or cultural site discovered during operations. If a significant discovery is made during operations, the regulations require operators to immediately notify BLM and to leave such discovery intact. BLM has 10 working days to protect or remove the discovery at the government's expense, after which operations may proceed.

Protection of Paleontological Resources. The existing 3809 regulations do not contain a process for inventory and evaluation of paleontological resources like the procedures for cultural resources under the National Historic Preservation Act. The existing regulations state that operators cannot knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains. Operators must immediately notify BLM of any paleontological resources discovered during operations and leave such discoveries intact. BLM has 10 working days to protect or remove the discovery at the government's expense, after which operations may proceed.

Protection of Cave Resources. The existing regulations do not specify performance standards for protecting cave resources. When operations would potentially harm cave resources, BLM considers them under the general requirements to prevent unnecessary or undue degradation.

Protection of American Indian Traditional Cultural Values, Practices, and Resources. The existing regulations do not specify performance standards for protecting American Indian traditional cultural values, practices, and resources. Often these resources are also historic properties that must be considered under the National Historic Preservation Act (NHPA). But NHPA does not prevent the disturbance of cultural resources. Rather, it provides a process for considering potential impacts and developing mitigation. Consultation with American Indians under other acts such as American Indian Religious Freedom Act (AIRFA) and the Religious Freedom Restoration Act (RFRA) is also required. Consultation does not preclude the activity but allows discussion for developing mitigation measures. BLM has extensively consulted with American Indians on mine projects, and American Indians have said that impacts to traditional cultural values, practices, and resources cannot be mitigated.

Roads and Structures. The existing regulations require an operator to minimize surface disturbance, use existing access where practical, maintain safe design, follow natural contours, and minimize cuts and fills. Operators must consult with BLM for roadcuts greater than 3-feet on the inside edge. All structures must be built and maintained according to state and local codes. Placing structures is addressed in separate rules at 43 CFR 3715.

Handling of Potentially Acid-Forming, Toxic, or Other Deleterious Materials. The existing regulations state that reclamation must include measures to isolate, remove, or control toxic or deleterious materials. Other requirements are imposed in response to the site-specific review when a Notice or Plan is processed.

In the past decade more of the deeper, sulfide-bearing ores, have been mined. As a result, acid rock drainage (ARD) has become an issue of concern for BLM when reviewing mining proposals. In 1992 BLM issued its acid rock drainage policy (Instruction Memorandum 96-79). This policy directs field offices to (1) review mining proposals for ARD potential, (2) require rock characterization, (3) emphasize source control of potentially acid-generating materials rather than treating effluent, and (4) inspect operations at least quarterly.

Leaching and Processing Operations and Impoundments. The existing regulations do not refer to cyanide or other chemicals used in mineral processing or leaching. The regulations do require that reclamation include measures to isolate, remove, or control toxic or deleterious materials. Mineral leaching requirements are developed during a site-specific review when BLM is processing a Notice or Plan.

In response to the increase in cyanide use on BLM-managed lands, BLM issued a cyanide management policy (Instruction Memorandum 90-566) in 1990. The policy guides field offices in managing cyanide operations by requiring BLM state offices to prepare cyanide management plans and by setting minimum standards for cyanide facility design, wildlife protection, monitoring, and quarterly agency inspections.

Stability, Grading, and Erosion Control. The existing regulations require reclamation to include reshaping disturbed areas where reasonably practicable and using measures to control erosion, landslides, and water runoff. A required slope angle or outcome is not specified for reshaping.

Pit Backfilling and Reclamation. The existing regulations do not specifically address mine pit backfilling. Disturbed areas must be reshaped "where reasonably practicable." The existing regulations also allow a stable highwall to be left where required to preserve evidence of mineralization. But no time frame is mentioned.

BLM field offices have dealt with pit backfilling on a project-specific basis, usually negotiating with operators for mitigation where backfilling a pit mine is uneconomic or infeasible. Sometimes off-site mitigation compensates for habitat lost to open pits. Occasionally BLM has determined that backfilling is practical and has required partial backfilling or backfilling at sequential open pit mines.

Financial Guarantees

The existing regulations require reclamation bonds only for Plan-level operations at BLM's discretion. No financial guarantees or reclamation bonding is required for Notice-level operations (except for Notice operators with a record of noncompliance).

Several policies have been implemented for bonding. At present, reclamation bonds are limited to $1,000 per acre for exploration disturbance and $2,000 per acre for mining disturbance, except for cyanide facilities or portions of operations with acid rock drainage potential, which are to be bonded at actual cost.

As part of state-federal coordination, operations are bonded in cooperation with the state regulatory agencies to prevent double bonding of operators. Bonding varies from state to state. For example, in Nevada BLM holds the bond for the State of Nevada. In Montana the state holds the bonds on BLM lands.

Inspection and Monitoring

Monitoring programs are developed during the review of Notices and Plans of Operations. The operator conducts environmental testing (water, air, soil, etc.) and submits the results to BLM. BLM may take samples during inspections to verify that the monitoring data is reliable.

Operators must allow BLM to inspect operations to determine compliance. Current policy is for inspections four times annually where cyanide is used or where a significant potential exists for acid rock drainage, and two inspections per year for all other active operations.

BLM works with operators when they are not complying with federal and state laws and regulations. Where compliance cannot be reached on a cooperative basis, BLM will issue a notice of noncompliance. If the operator still fails to comply, BLM may take other measures: requesting help from federal or state regulatory agencies, issuing records of noncompliance, and forwarding the case to the Department of the Interior Regional Solicitor and the Justice

Department. An operator with a record of noncompliance must submit a Plan of Operations and provide reclamation bonding for activity that otherwise could have been conducted under a Notice.

Penalties for Noncompliance

Under policy developed for the existing regulations, if an operator does not comply with a notice of noncompliance, a record of noncompliance may be established. Operators with a record of noncompliance have to file a Plan of Operations for activities that would otherwise be conducted under a Notice and have to post a reclamation bond with BLM even if they already have a bond posted with the state. In other cases the courts may enjoin unlawful activities and impose penalties for damages or violations of the 3809 regulations and the Federal Land Policy and Management Act.

Appeals Process

The existing regulations contain two appeals processes under which BLM decisions may be appealed, depending on whether the operator or another party is appealing. All appeals must be filed within 30 days of the decision.

Operators that are adversely affected and want to appeal must appeal to the BLM state director. The state director then makes a decision on the appeal. Operators adversely affected by a state director's decision may appeal that decision to the Interior Board of Land Appeals (IBLA). Anyone other than the operator that is adversely affected may file an appeal of BLM's decisions directly with IBLA. BLM's decision is in full force and effect during an appeal before either the state director or IBLA. A stay from the effect of the decision may be granted while the appeal is pending.

Appeals to the state director are usually decided within several weeks or months. Appeals to IBLA take much longer. The current backlog in IBLA for a routine appeal is about 3 years. Requests to IBLA for stays are usually responded to within 6 months. If a case is granted expedited consideration, IBLA may decide the case in less than a year.

Implementation

Overall activity levels in the form of new or amended Notices and Plans are decreasing. But total program expenditures under the existing regulations are expected to remain constant or slightly increase in the future because of three factors: inflation and cost of living adjustments, increased regulatory attention given to technically complex or controversial projects, and the increasing number of operations entering the closure phase and thereby requiring more intensive regulatory involvement.

Alternative 2: State Management

Under Alternative 2 BLM would defer regulating exploration and mining to the states. The 3809 regulations would define *unnecessary or undue degradation* to mean failure to meet all local, state, and federal laws and regulations for conducting exploration and mining. (State regulatory programs are summarized in Appendix D.) No other rules would be needed.

BLM would neither review nor approve of any specific project. Nor would any federal decision or undertaking be subject to NEPA review or compliance with Section 106 of the National Historic Preservation Act (NHPA). While the operations would still have to comply with federal laws such as the Clean Water Act and Endangered Species Act, BLM would not regulate the operations.

In accordance with the Federal Land Policy and Management Act, BLM would continue to prepare land use plans to determine areas to be opened or closed to operations under the Mining Law through the withdrawal process. State regulators could also use land use plans for information on special management concerns in areas open to operations. BLM would continue to process mineral withdrawals and examine mining claims for validity to meet its land management objectives but would not be involved in day-to-day regulation of operations.

Unnecessary or Undue Degradation Definition

The 3809 regulations would define *unnecessary or undue degradation* to require only that the operator meet all local, state, and federal laws and regulations. Compliance with state programs for regulating mining would be considered adequate for preventing unnecessary or undue degradation as required by the Federal Land Policy and Management Act.

Project Area Definition

Project areas would be defined according to state programs. Any exclusive use of access roads, powerlines, pipelines, etc. would require rights-of-way from BLM.

Federal Lands Definition

The definition of federal lands would not change.

Disturbance Categories and Thresholds

The disturbance categories used under the existing regulations would not apply under Alternative 2 because operators would not have to file a Notice or Plan with BLM. BLM would have no category or threshold classification. The state would be responsible for all permitting of activities on BLM lands under state categories.

Claim Validity and Valid Existing Rights

No change from the existing regulations. BLM would exercise its option of examining a mining claim when needed to protect resources.

Common Variety Minerals

No change from the existing regulations. BLM would require an operator suspected of mining common variety minerals to place possible fair market value in escrow until after BLM completes a common variety determination. BLM might seek a court order to stop operations if the monies are not escrowed.

State-Federal Coordination

States would regulate all mineral activity on BLM lands. BLM would periodically evaluate the state program to determine if it is preventing undue or unnecessary degradation. BLM would also continue to use the land use planning and withdrawal process to decide which areas are open or closed to mining. BLM would give comments and input to states during their review and approval process for activity on BLM lands. BLM's role would be that of a land owner.

Existing Operations

Existing activity would continue according to state requirements.

Notice and Plan of Operations Content and Processing

No Notices or Plans of Operations would be submitted to BLM for review or approval. Operators would follow state program requirements for content and processing of activities. BLM would not process applications, conduct project-level National Environmental Policy Act analysis, or make decisions.

Performance Standards

General. Performance standards would be based on state standards and requirements. The state standards for air, water, wildlife, reclamation, and other resources would be the controlling standards for operations on public lands. Other federal requirements such as the Endangered Species Act would continue to apply under the administration of the responsible federal agency.

Land Use Plans. BLM would retain all responsibility for preparing land use plans, for designating special status areas, and for determining areas open or closed to the operation of the Mining Law.

Surface and Ground Water Protection. All activities would be conducted according to state and federal water quality laws or the state program delegated under the Clean Water Act.

Wetlands and Riparian Area Protection. Operators would have to comply with state requirements and obtain permits from the Army Corps of Engineers for dredging or filling in waters of the United States under Section 404 of the Clean Water Act.

Soil or Growth Media Handling. Topsoil would have to be salvaged and reapplied according to state standards.

Revegetation Requirements. Disturbed areas would have to be revegetated according to state standards.

Fish and Wildlife Protection and Habitat Restoration. State standards would have to be met for protecting fish and wildlife. The taking of a threatened or endangered species or migratory birds would still be prohibited under the Endangered Species and Migratory Bird Treaty Acts.

Protection of Cultural Resources. State standards for protecting cultural resources would have to be met.

Protection of Paleontological Resources. State standards for protecting paleontological resources would have to be met.

Protection of Cave Resources. State standards for protecting cave resources would have to be met.

Protection of American Indian Traditional Cultural Values, Practices, and Resources. State standards for protecting American Indian traditional cultural values, practices, and resources would have to be met. American Indians could request help from BLM to facilitate consultation with the state on a project's potential impacts. The Secretary of the Interior's trust responsibilities would continue, but BLM would not be in a position to require mitigation measures.

Roads and Structures. Roads would be built and maintained according to state standards. All structures would be built and maintained according to state and local codes. Structures are addressed in separate rules at 3715.

Handling of Potentially Acid-Forming Toxic or Other Deleterious Materials. Potentially acid-forming material would be managed according to state requirements. Discharges could not exceed state and federal effluent limits under the Clean Water Act.

Leaching and Processing Operations and Impoundments. Leaching and processing operations would have to be designed, built, and operated according to state standards.

Stability, Grading, and Erosion Control. Stability, Grading, and Erosion Control would have to be accomplished according to state regulations.

Pit Backfilling and Reclamation. Mine pits would be backfilled or reclaimed according to state requirements.

Financial Guarantees (Bonding)

No BLM bonding would be required. States would set, hold, and administer any financial guarantees according to state regulations. Existing reclamation bonds filed with BLM would either be transferred to the states for administration or returned to operators.

Inspection and Monitoring

States would conduct inspection and monitoring programs for compliance with state regulations. BLM could inspect sites to verify that lands are not undergoing unnecessary or undue degradation.

Penalties for Noncompliance

The state enforcement and penalties programs would be used. BLM would take no more enforcement action. Other agencies (Environmental Protection Agency, Fish and Wildlife Service) could still issue citations for violation of environmental laws under their statutory authorities.

Appeals Process

There would be no appeals process on project approvals or enforcement through BLM because a federal action would not normally be involved. Should BLM act under other regulations such as for rights-of-way, the decision could be appealed as provided by regulations.

Implementation

The cost for BLM to implement the regulatory program under Alternative 2 would be greatly reduced from current and projected levels under the existing regulations (Alternative 1). BLM would still have the ongoing program costs of monitoring to verify that state programs are being properly applied and are preventing unnecessary or undue degradation of the public lands. But once BLM discontinues program administration, this cost would be minimal compared to the cost of the existing program. The program would cost BLM 15-20% of the current program budget to maintain. These costs assume that BLM does not give funding to the states.

Alternative 3: Proposed Regulations (Proposed Action and Preferred Alternative)

The proposed regulations would replace the existing regulations at 43 CFR 3809. The full text of the proposed regulations is in Appendix B. Major changes from the existing regulations are summarized in Tables 2-1 and 2-2, and described below.

Unnecessary or Undue Degradation Definition

The proposed regulations would replace the "prudent operator" standard in the existing regulations with a requirement to comply with the performance standards section of the proposed regulations. The proposed definition also incorporates the Surface Use Act (PL 69-167) requirement that activities must be reasonably incident to prospecting, mining, or processing operations.

Project Area Definition

The proposed regulations would change the definition of the project area to account for the possibility that mining claims in a project areas might be held by more than one owner. All access and support facilities are still included in the definition.

Public Lands Definition

The scope of the proposed regulations and the definition of public lands would expand the category of lands on which the 3809 regulations would apply. The proposal is to include split-estate lands patented under the Stock Raising Homestead Act, where the surface is private but the mineral estate is reserved to the United States and open to operations under the Mining Law.

Disturbance Categories and Thresholds

Casual Use. The proposed definition of casual use would exclude suction dredges from this category. The definition would also exclude hobby or recreational mining if the cumulative effects of many operations result in more than negligible disturbance. BLM may designate in the local land use plans recreational mining levels that require either a Notice or Plan of Operations, or determine that the cumulative effects of recreational mining cause more than negligible disturbance and that a Notice or Plan is required.

The proposed regulations would create a defacto fourth category of surface disturbance. While suction dredging is no longer casual use, Notices would not always be required. If (1) the intake diameter of the suction dredge is 4 inches or less, (2) the state has a permitting system for suction dredges, and (3) the state and BLM have developed an interagency agreement on suction dredge permitting, then the operator would not have to file a Notice, even though suction dredging is not considered casual use.

Notices. Under the proposed regulations the threshold for requiring a Notice would be expanded to include all suction dredging where the intake diameter exceeds 4 inches, operations that use suction dredges of any size where a state permit is not required, or operations where a state permit is required but BLM has not developed an interagency agreement with the state on suction dredge regulation. Some hobby or recreational miners would be required to file a Notice if the cumulative impacts of many operations result in more than negligible disturbance.

Plans of Operations. The threshold for when a Plan of Operations would be required is proposed to be changed in two possible approaches or subalternatives. The first approach would be to require a Plan of Operations for any activity disturbing more than 5 acres. A Plan would also always be required, regardless of disturbance size, for activity exceeding casual use and occurring on (1) special status areas such as areas of critical environmental concern, areas closed to off-road vehicles, wild and scenic rivers, national monuments, and national conservation areas; (2) lands withdrawn or segregated from the Mining Law; and (3) sensitive lands recognized through the land use planning process. A Plan of Operations would always be required for leaching or processing involving the use, addition, or storage of chemicals, such as cyanide or sulfuric acid. A Plan of Operations would always be required for activity on private lands located over federal minerals, where the operator does not have the written consent of the surface owner.

- OR -

The other approach considered in the proposed regulations would be to use the same regulations as the Forest Service for determining the Plan of Operations threshold. The determination as to whether a Plan of Operations would be required would depend on the potential for significant disturbance of surface resources. This determination would be based on a case-by-case review of a Notice of Intention, which the operator would have to provide for disturbance exceeding casual use.

Claim Validity and Valid Existing Rights

The proposed regulations require validity exams to determine valid existing rights before BLM approves a Plan of Operations for areas segregated or withdrawn from operation of the mining laws. This change would incorporate what had previously been within BLM's discretion and would continue to provide discretion for segregated lands.

Common Variety Minerals

The proposed regulations incorporate a process that has been in general practice for mining of minerals that are under dispute as to being locatable under the Mining Law or of common variety and therefore saleable and subject to sale for fair market value. The proposed regulations would allow mining of the material under a Notice or Plan of Operations subject to the operator's placing potential fair market value in escrow pending the outcome of a common varieties determination by BLM.

The proposed regulations would also allow BLM to sell mineral materials from an unpatented mining claim with the written consent of the claimant.

State-Federal Coordination

The proposed regulations would establish two types of agreements between BLM and the state: (1) an agreement that allows joint administration of the regulatory program or (2) an agreement where BLM defers to state administration some or all of the program. An important provision of the proposed regulations is that if the state program is determined adequate to meet the BLM equivalent, then BLM *must* give the state the lead for regulation if the state requests the lead.

But even with a complete deferral to state regulation, the proposed regulations would require BLM to retain the following: BLM concurrence on Plan of Operations approvals, analysis responsibilities under the National Environmental Policy Act, concurrence in the approval and release of any financial guarantee, consultation and coordination duties for compliance with the National Historic Preservation Act and the Endangered Species Act, and responsibility for any government-to-government consultation with American Indian tribes. BLM would also retain the option to conduct inspections and take enforcement actions.

Regardless of the cooperative agreement in place, BLM would always retain responsibility for land use planning for BLM-managed lands. The state could not restrict land use on BLM-managed lands, only regulate the activity authorized by the public land laws.

Existing Operations

The proposed regulations would be applied to operations that are existing or pending as described below:

- All existing Notices would expire 2 years after the effective date of the regulations. If the operator chooses to continue operations beyond the 2-year period, the Notice would have to be extended. To extend the Notice the operator would have to provide an acceptable financial guarantee.
- Any approved Plans of Operations existing on the effective date of the regulations could continue as originally approved.
- New mine facilities added to existing Plans of Operations would be required to comply with the new regulations.
- Modifications to existing mines would be required to comply with the new performance standards and information collection requirements unless the operator demonstrates that compliance is not feasible for environmental, safety, or technical reasons.
- Any pending Plans of Operations submitted to BLM but not yet approved by the effective date of the new regulations would have to comply with the new regulations unless an environmental assessment or draft EIS has already been completed.

Notice and Plan of Operations Content and Processing

Notices. The proposed regulations would make it explicit that the time allowed for BLM to review a Notice does not begin until BLM receives a "complete" Notice. The proposed regulations would also increase the review times for Notices once they are complete from 15 calendar days to 15 *business* days. The proposed regulations would allow BLM to take 15 business days to review a complete Notice to determine if any unnecessary or undue degradation might occur. Other extensions of the time frame would be possible under the proposed regulations to complete consultation on access or to allow BLM to inspect the project areas before beginning operations.

The proposed regulations contain more detail on the contents of a Notice. Most of this information is already being provided for Notices under the existing regulations. One addition is the requirement to provide a reclamation cost estimate. The proposed regulations contain a new requirement that all Notice-level operations must provide a financial guarantee to ensure performance of reclamation (see section on financial guarantees) and that the operator must prepare the initial reclamation cost estimate.

Plans of Operations. The proposed regulations would require Plans of Operations to contain information on the operator, a description of the operation, and the operation's reclamation and monitoring plans. These requirements for the most part formalize existing practices. The proposed regulations would further require the operator to supply baseline environmental data as specified by BLM on a site-specific basis. Such data is not required under the existing regulations although many of the larger mining operations have routinely provided it to facilitate National Environmental Policy Act compliance.

The proposed regulations would increase the time frame for reviewing Plans of Operations from 30 calendar days to 30 *business* days. The regulations specify that a complete proposed Plan of Operations must be provided for BLM to complete its review.

The proposed regulations establish another review period for reclamation bond calculations. This period may run concurrently or sequentially with the National Environmental Policy Act process. Plans of Operations cannot be approved until 30 days after the reclamation bond calculations have been published for public review and comment.

Performance Standards

General. The proposed regulations contain performance standards that are mainly outcome based, describing the resource condition that must be achieved or the performance a particular operating component must meet, instead of specifying a particular design.

The proposed regulations specify use of most appropriate technology and practices (MATP). MATP simply means that the technology and practices described for use must have demonstrable feasibility, success, and practicality in meeting the performance standards. If the performance standards can be met using the technology and practices proposed, then the requirement to use MATP has been met.

The proposed regulations also contain a performance standard to follow a reasonable and customary sequence of operations. This requirement is not specified in the existing regulations but is implied under the term *unnecessary or undue degradation*.

Land Use Plans. The proposed regulations would require operations and postmining land use to comply with land use plans. This requirement also recognizes that the land use plans must not impair the rights of claimants under the Mining Law. Land use plans cannot be used by themselves to preclude mineral activity but should be used for guidance on regulating the activity. This performance standard is not intended to replace the withdrawal process used to remove lands from operation of the Mining Law. If resource conflicts cannot be mitigated through regulation, the withdrawal process may be used to preclude the activity.

Surface and Ground Water Protection. All operations would have to comply with state and federal laws and regulations protecting water quality and quantity. The proposed regulations would require that mine pit water quality not endanger wildlife, public water supplies, or users.

For water pollution and dewatering, the proposed regulations would require that operation and reclamation practices minimize water pollution and changes in flow in preference to water treatment or replacement. Specifying a preferred approach, this standard is an exception to the general statement that the performance standards under Alternative 3 are outcome based.

The proposed regulations would contain requirements for exploration drilling and drill hole plugging. Drill cuttings and mud would have to be contained onsite. All exploration drill holes would have to be plugged to prevent mixing of waters from aquifers, impacts to beneficial uses, downward water loss, or upward water loss from artesian conditions. The surface would have to be plugged to prevent the direct inflow of surface water into the borehole and to eliminate the open hole as a hazard.

Wetlands and Riparian Area Protection. Both the existing and proposed regulations require that state and federal permits be obtained for dredging or filling in waters of the state or the United States. Included would be Section 404 permits under the Clean Water Act (CWA) issued by the U.S. Army Corps of Engineers with certification by the state water quality agency. No Army Corps of Engineers permits are required for riparian areas that do not fall within the ordinary high water mark and therefore are not jurisdictional waters.

The proposed regulations would build on the current Clean Water Act permitting requirement by specifying a site-selection hierarchy for both wetlands and riparian areas. The proposed regulations would require that disturbance (1) avoid wetland and riparian areas or (2) minimize impacts to wetlands and riparian areas, and (3) mitigate damage to wetland and riparian areas through measures such as restoration or offsite replacement.

Soil or Growth Media Handling. The proposed regulations would require that topsoil or other growth media be removed from the lands disturbed by operations and segregated and preserved for later use in revegetation during reclamation. Where feasible, the proposed regulations would direct transport of topsoil from the salvage site to use in reclamation to preserve more of the soil's fertility.

Revegetation Requirements. The proposed regulations would require that all disturbed lands be revegetated to establish a stable and long-lasting vegetative cover that is self-sustaining and comparable in both diversity and density to preexisting natural vegetation. Native species would be used to the extent feasible, and disturbed land would be revegetated according to the schedule in the reclamation plan. The proposed regulations would also require operations to be managed to prevent the introducing of noxious weeds and to control existing infestations.

Fish and Wildlife Protection and Habitat Restoration. The requirements from the existing regulations would be carried forward. The operator would have to prevent harm to threatened or endangered species and their habitats that might be affected by operations. Fisheries and wildlife habitat would have to be rehabilitated.

The proposed regulations would also require the operator to minimize disturbances and adverse impacts on fish, wildlife, and related environmental values. All processing solutions, reagents, or mine drainage that might be toxic to wildlife would have to be fenced or netted to prevent wildlife access. Previously, fencing and netting had been required by policy and incorporated during project-specific reviews.

Protection of Cultural Resources. Section 106 of the National Historic Preservation Act would continue to be used to develop mitigation for historic properties found before a Plan of Operations is approved. The proposed regulations would also require that operators not knowingly disturb, alter, injure, or destroy any historical or archaeological site, structure, building, or object discovered during operations. These discoveries would be left intact, and the operator would immediately notify BLM of the discovery so that BLM could decide on proper means of data recovery or salvage.

The proposed regulations would require operations to cease for 20 business days to allow for data recovery of discovered cultural resources. This period is an increase over the existing requirement of 10 business days. The proposed regulations would also allow BLM to determine who bears the cost of recovery instead of assuming that the government would pay the cost.

Protection of Paleontological Resources. The proposed regulations for protecting paleontological resources would be similar to regulations for cultural resources except no formal consultation process would be required like that under the National Historic Preservation Act (NHPA). The proposed regulations would require operations to cease for 20 business days to allow data recovery of discovered paleontological resources. This period is an increase over the existing requirement of 10 business days. The proposed regulations would also allow BLM to determine who bears the cost of recovery instead of assuming that the government would pay the cost If BLM were to incur such costs, the proposal could allow BLM to then recover these costs from the operator, based on Section 304(b) of the Federal Land Policy and Management Act.

Protection of Cave Resources. The proposed regulations would add a new requirement to protect cave resources through identification and mitigation plans before disturbance. Should cave resources be discovered, the proposed regulations would require operations to stop for 20 business days to protect or preserve the resource. BLM would determine who bears the cost of cave protection.

Protection of American Indian Traditional Cultural Values, Practices, and Resources. The proposed regulations do not specify performance standards for these resources. The existing process of consultation and mitigation described in Alternative 1 would continue to be used to develop mitigation.

Some special status areas are expected to be designated because of the presence of American Indian traditional cultural values, practices, and resources. This designation would require smaller operations to file a Plan, providing for increased consultation and mitigation development procedures.

Roads and Structures. The proposed regulations would require that access roads minimize surface disturbance, existing access be used where practical, safe design be maintained, natural contours be followed, and cuts and fills be minimized. All structures would be built and maintained according to state and local codes. Structures for use or occupancy are addressed in separate rules at 43 CFR 3715.

Handling of Potentially Acid-Forming, Toxic, or Other Deleterious Materials. When addressing the handling of potentially acid-forming, toxic, or other deleterious materials, the proposed regulations would incorporate guidance from BLM's acid rock drainage policy and current practices used by most field offices.

The proposed regulations would require the use of static or kinetic testing of material to be mined to identify and guide the handling and placement of potentially acid-forming materials. The proposed regulations would also require that management of this material be fully integrated with operational procedures, facility design, and environmental monitoring programs throughout the project life.

The proposed regulations would establish a hierarchy for control and mitigation of potential impacts of the mining of these materials. Acid rock drainage (ARD) control would focus on prevention or control of the oxidation of acid-forming minerals. If the formation of ARD cannot be completely prevented, potential migration of ARD must be prevented or controlled. Capture and treatment of ARD, or other undesirable effluent, to the applicable standard is required if source and migration controls do not prove effective. Long-term effluent capture and treatment would not replace the need for source control and could be relied upon only after source control methods have been employed.

Leaching and Processing Operations and Impoundments. The proposed regulations would incorporate current practices in use by most field offices and the specific requirements from BLM's cyanide management policy. These requirements would apply to mining operations that use cyanide or other leaching agents.

The proposed regulations would require cyanide facilities to be able to contain, at the least, the maximum operating water balance in addition to the 100-year, 24-hour storm event, including snowmelt events and expected draindown from heaps during power outages. This is a slight change from the cyanide management policy, which stated that facilities must either contain the 100-year, 24-hour storm, or meet minimum state requirements.

The proposed regulations would require the building of secondary containment systems around vats, tanks, or recovery circuits adequate to prevent the release of toxic solutions in a primary containment failure.

The proposed regulations would require monitoring to detect any leakage from heaps, tailing impoundments, and other solution containment structures. As part of reclamation, upon release to the environment or during temporary closure, cyanide solution and heaps would have to be neutralized or detoxified to the levels specified in the approved Plan of Operations.

The proposed regulations would require operators to take measures to prevent wildlife mortalities. All areas with exposed cyanide solution, including heaps, would be fenced and covered to prevent access by the public, wildlife, and livestock. Detoxification of exposed solutions might be used in lieu of fencing tailings impoundments. Warning signs would need to be posted near any perceived water sources that contain cyanide or other leachate.

Stability, Grading, and Erosion Control. The proposed regulations would specify that erosion must be minimized during all phases of operations. All disturbed areas would have to be graded or otherwise engineered to a stable condition to minimize erosion and facilitate revegetation. All areas would be recontoured to blend in with the premining natural topography to the extent feasible.

Pit Backfilling and Reclamation. The proposed regulations would establish a requirement that mine pits would have to be backfilled unless backfilling is demonstrated to be infeasible. The burden of proof of the feasibility of pit backfilling would be placed on the operator. BLM would then determine the degree of backfilling, if any, required from a site-specific operator demonstration of economic feasibility, environmental soundness, and safety. Mitigation would be required for pit areas that are not backfilled.

The economic feasibility determination expected under the proposed pit backfilling requirement would not be a detailed review of the project economics, such as rate of return on investment. BLM does not intend to determine what is a reasonable profit margin for mine operators. That an operator could completely backfill a pit and still show a profit does not automatically mean BLM would require backfilling. Nor would an operation that appears to be uneconomic, even without any backfilling, be exempt from backfilling.

When considering the economic feasibility of pit backfilling, BLM would weigh the expected environmental benefits in relation to operational economic factors such as whether the project is a single or multiple pit operation, the distance and grade from mine site to waste rock storage versus backfill location, the direct haul cost versus temporary storage and rehandling cost, and reclamation costs as a function of disturbance area size.

The proposed regulations require mitigation for pit areas that are not backfilled. The type of mitigation expected is not a dollar-for-dollar cost compensation (i.e. for every $1 of backfill cost saved $1 must be spent on mitigation) or necessarily an acre-for-acre compensation (i.e. for every acre of unreclaimed pit an acre must be provided as mitigation). Instead, the intent of the mitigation requirement is to ensure that the impacts of not backfilling pit areas are mitigated. For example, if leaving a pit highwall creates a safety hazard, required mitigation may include erecting perimeter fencing and posting hazard signs. If the pit area is in critical wildlife habitat that cannot be restored unless backfilled, then the mitigation may require providing replacement habitat at another location.

The existing regulations allow areas to remain unreclaimed to preserve evidence of mineralization. The proposed regulations would also allow disturbed areas to remain unreclaimed for the same reason, but only temporarily. Operators would eventually have to reclaim all areas for which they are responsible. Any areas left temporarily open to establish mineralization must be described in the reclamation plan along with a time frame for completing final reclamation.

Financial Guarantees (Bonding)

The proposed regulations would require reclamation bonding for all Notice- and Plan-level operations. This is major change from the existing regulations, which do not require Notice-level operations to provide financial assurance. The financial guarantee (reclamation bond) would have to cover 100% of the estimated cost for BLM to perform the reclamation according to the reclamation plan. This is a change from the policy under the existing regulations, where reclamation bond amounts would generally be limited to $1,000/acre for exploration disturbance and $2,000/acre for mining disturbance.

The proposed regulations would allow equivalent bonding by state agencies but only if the bonding instrument is also redeemable by the Secretary of the Interior. State bond pools and state-accepted corporate guarantees would also be allowed. The public would be allowed to comment before final bond release. The proposed regulations would also specify setting up trust funds or other funding mechanisms to be used for postreclamation treatment or maintenance.

Inspection and Monitoring

Operators would have to allow BLM to inspect operations to determine compliance with the proposed regulations. The current policy is to inspect operations four times annually where cyanide is used or a significant potential exists for acid rock drainage. This policy would be adopted into the proposed regulations. The proposed regulations would also allow citizens under certain circumstances to accompany the BLM inspector upon prior notification.

Environmental monitoring programs would continue to be developed during the review of Notices and Plans of Operations. The operator would conduct environmental testing (water, air, soil, etc.) and submit the results to BLM. BLM could take samples during inspections to verify the monitoring program results.

Penalties for Noncompliance

The proposed regulations would allow BLM to issue enforcement orders for failure to comply with the Notice or Plan or the regulations. Two types of enforcement orders could be issued: the noncompliance order and the suspension order. Temporary immediate suspensions would be allowed to protect health, safety, or the environment from imminent danger or harm. The orders would specify how the operation is not complying with the regulations, the portion of operations that must cease or be suspended, the actions that must be taken to correct the noncompliance, and the time by which corrective actions must be taken and completed. BLM could revoke a Plan or nullify a Notice upon finding that the operator has failed to correct violations within the specified time.

The proposed regulations would allow BLM to issue discretionary civil penalties of up to $5,000/day for violation of the regulations or failure for comply with an enforcement order. The operator could request a hearing with the Department of the Interior, Office of Hearings and Appeals on the amount of the civil penalty or enter into settlement discussions with BLM.

Appeals Process

The proposed regulations would allow *both* operator and third parties to appeal directly to the Interior Board of Land Appeals. Appeals to state directors might also be authorized but might be the subject of a separate rulemaking. All decisions would remain in *full force and effect* unless a written request for a stay is granted by the reviewing entity.

Implementation

It is difficult to predict the implementation costs for BLM to administer the proposed regulations, but under the proposed regulations the costs would increase by 25 to 35%.

Alternative 4: Maximum Protection

Under Alternative 4 the 3809 regulations would contain prescriptive design requirements for resource protection. These requirements would increase the level of environmental protection and give BLM more discretion in determining the acceptability of proposed operations. Provisions of Alternative 4 are summarized in Tables 2-1 and 2-2. Major changes from the current regulations include expanded application to lands patented under the Stock Raising Homestead Act, numerical performance standards for mineral operations, required pit backfilling, elimination of Notices so that all disturbances greater than casual use require a Plan of Operations, required conformance with land use plans, and prohibitions against causing irreparable harm or having to permanently treat water.

Unnecessary or Undue Degradation Definition

The definition of unnecessary or undue degradation would be changed to require a greater level of resource protection and impose a design-oriented regulatory program. *Unnecessary or undue degradation* would be defined to mean that operations could not irreparably harm resources and that the operator would have to use best available technology and practices as environmental controls.

Project Area Definition

The project area would include the same activities as under the existing regulations. The area's boundary would have to be defined either by legal description or a metes and bounds survey and approved by BLM. Lands could lie within only one project area at a time to prevent confusion over operators and their reclamation liabilities.

Public Lands Definition

The definition of public lands on which the regulations apply would be expanded to include all lands whose mineral estate is federal and surface is private or state owned. The definition would also include lands where BLM manages the surface but the mineral estate is private or state owned. Surface owner consent would be required before BLM would approve operations on non-BLM managed surface.

Disturbance Categories and Thresholds

Casual Use. For all activity other than claim staking and surface sampling the operator would have to consult with BLM to determine if the activity is casual use or if a Plan of Operations is required. Some activities now regarded as casual use, such as hand digging, geochemical or geophysical exploration, and small-scale suction dredging, would require an approved Plan of Operation before the land could be disturbed.

Notices. The regulations under Alternative 4 would not contain a Notice provision. All types of activity now conducted under a Notice would require an approved Plan of Operations before the land could be disturbed.

Plans of Operations. All disturbance greater than casual use would require a Plan of Operations. A Plan of Operations might be required for activity as slight as obtaining small surface samples with hand tools. But the content and processing requirements for Plans would greatly vary, depending on the size of the proposed activity.

Claim Validity and Valid Existing Rights

All Plans of Operations proposing mining would require an economic feasibility study. This requirement would apply to all lands that are subject to mining claims with valid existing rights, not just those that have been segregated or withdrawn. To justify the potential environmental impacts the feasibility study would be used to determine whether the proposed operation is feasible. Any Plans of Operations that are not economically feasible would not be approved. Exploration plans would not have to be supported by an economical feasibility determination because the purpose of exploration is to obtain data for evaluating feasibility.

Common Variety Minerals

Mining of material thought potentially to be of common variety, and therefore not locatable under the Mining Law, would not be allowed under the 3809 regulations. Common variety determinations would have to be made and the material would have to be classified as a locatable mineral before BLM would approve Plans of Operations. The regulations would not allow the use of an escrow account pending the outcome of the common variety determination.

State-Federal Coordination

The regulations would not allow states to play the lead role for any element of the surface management program on BLM lands. Rather, the regulations would provide for BLM to coordinate and work cooperatively with the states so that operations meet the requirements of both state and federal regulations. Conditions would be placed on operations so that the most protective environmental requirement would apply. Should an operation be unable to comply with both BLM and state regulations, it would have to meet BLM requirements.

Existing Operations

Under Alternative 4 all existing Notices would expire in 2 years. Disturbance would have to be reclaimed within 2 more years, or the Notice would have to be replaced by a Plan of Operations. Any existing or pending Plans of Operations would be required to comply with the new regulations in the following manner:

1. Within 180 days the operator would have to file a modified Plan of Operations describing how the requirements of the new regulations would be met.
2. BLM would determine the adequacy of the modification in meeting the new requirements and might grant exceptions from requirements for economic, environmental, safety, or technical reasons.
3. Any new facilities added to an existing Plans of Operations would have to comply with the regulations unless the operator can show that compliance is not feasible for

environmental, safety, or technical reasons.

4. Modifications made to existing mine facilities would have to comply with the regulations unless compliance is shown not to be feasible for environmental, safety, or technical reasons.

Plan of Operations Content and Processing

Because Alternative 4 would not have a Notice provision, all activity greater than casual use would require a Plan of Operations. The content and processing of the Plan would generally be the same as that described for Alternative 3. But certain performance standards, such as the requirements to prevent irreparable harm, prohibit permanent water treatment, and complete mine pit backfilling, would make Plan approval less certain.

Performance Standards

General. The regulations would specify the minimum national design standards for exploration, mining, and reclamation and mandate that activities not cause irreparable harm. Irreparable harm would mean to permanently impair the productivity of the land.

Land Use Plans. The regulations would require that all operations be conducted according to the approved BLM land use plans in areas open to activity under the Mining Law. But land use plans could not be used in place of segregations and withdrawals. Land use plans would be used to help determine sensitive areas and to define what would constitute irreparable harm to these resources.

Surface and Ground Water Protection. The water quality in mine pit lakes could not exceed the acute toxicity standard for metals so as not to endanger wildlife, public water supplies, or users. The regulations would require that operators not rely on water treatment to meet the water quality standards for more than 20 years after closure. The operator would be required to show that, after closure, the operation could comply with the water quality standards through source controls after 20 years. BLM would not approve Plans of Operations that could not demonstrate compliance with this standard.

The regulations would require the operator to restore the hydrologic balance of surface and ground water upon reclamation. Water could be supplementally pumped or transported to restore the hydrological balance but not for longer than 20 years after mine closure. Plans that could not demonstrate compliance with this standard would not be approved.

The regulations would specify minimum design standards for drilling and plugging of exploration drill holes. All drill cuttings and mud would have to be contained onsite using sumps or portable tanks. All exploration drill holes would have to be plugged from bottom to no more than 10 feet of the surface with bentonite or a similar compound to prevent mixing of waters from aquifers, impacts to beneficial uses, downward water loss, or upward water loss from artesian conditions. The upper 10 feet would have to be plugged with cement.

Wetlands and Riparian Area Protection. Specific site selection and mitigation criteria would require the operator to (1) avoid locating operations in wetland and riparian areas where possible, (2) minimize impacts to wetlands and riparian areas, and (3) mitigate damage to wetland and riparian areas by restoring them to proper functioning condition within 10 years after operations close or by using offsite replacement at a ratio of at least 1.5 acres for every acre disturbed.

Soil or Growth Media Handling. Soil or other growth media would be removed from the lands disturbed by operations, segregated according to soil horizon, and preserved for later use in revegetation during reclamation.

Revegetation Requirements. All disturbed lands would have to be revegetated according to the schedule in the reclamation plan and to establish a stable, long-lasting, and self-sustaining vegetation cover. Canopy cover would have to consist of at least 90% of adjacent undisturbed lands with similar elevation, slope, and aspect at the same time of year. Only native species could be used. Operations, including revegetation, would have to prevent the introducing of noxious weeds or eliminate any existing infestations.

Fish and Wildlife Protection and Habitat Restoration. Within 10 years of closure the operator would have to minimize disturbance and restore any disturbed habitat to proper functioning premining condition.

Special status species would be protected the same as threatened and endangered species. Mineral operations could not affect special status species, causing them to be listed as threatened or endangered.

Protection of Cultural Resources. The regulations would not limit the time for data recovery of significant cultural resources and would require that the operator bear the cost of recovery.

Protection of Paleontological Resources. The regulations would not limit the time for data recovery of significant paleontological resources and would require that the operator bear the cost of recovery.

Protection of Cave Resources. The regulations would not limit the time for data recovery of significant cave resources and would require that the operator bear the cost of recovery.

Protection of American Indian Traditional Cultural Values, Practices, and Resources. Special status areas, designated through land use planning as containing American Indian traditional cultural resources, would require concurrence by affected American Indians before BLM would approve a Plan of Operations.

Roads and Structures. Roads built for access, haulage, service, or exploration could not have maximum sustained grades greater than 10%. Short pitches of less than 300 feet might be used to take advantage of topography, but the grade could not exceed 12%. Diagonal drainage barriers would be placed as follows:

Grade %	Max. Spacing (ft)
0 - 2	200
3 - 8	150
9 -12	80

All roads would be reclaimed to approximate original contours. All structures would be built and operated according to codes and removed at the end of operations.

Handling of Potentially Acid-Forming, Toxic, or Other Deleterious Materials. Alternative 4 would have the same provisions as Alternative 3 with more design specifics and unsuitability criteria. BLM could set criteria to determine if certain deposits are unsuitable for mining because of their acid-forming and acid-neutralizing mineral content, climate, and control technologies. Materials exceeding these criteria could not be mined. Potentially toxic mine wastes (e.g. pond sludge and lab wastes) could not be disposed of on BLM-managed lands. And plans proposing treatment periods longer than 20 years to meet standards would not be acceptable and would be denied.

Leaching and Processing Operations and Impoundments. The Alternative 4 regulations would contain the same elements as described for Alternative 3 with more design specifics.

Cyanide facilities would have to be able to contain, at the least, the maximum operating water balance in addition to the probable maximum precipitation event, including snowmelt events and expected draindown from heaps during power outages. Secondary containment systems would have to be built around vats, tanks, or recovery circuits adequate to contain 110% of the maximum contents in the event of primary containment failure.

All leach pad liner systems would have to employ at least two synthetic liners, with a drain layer to reduce the hydrostatic head, over at least 24 inches of compacted clay. Each synthetic liner would have to be at least 40 mils thick. The clay liner would have to be compacted to a permeability of less than 1x10-7 cm/sec. Leak detection and recovery systems would be required for heaps and other solution containment structures.

The ore heap and leach pad would have to be stable throughout construction and operation.

A minimum factor of safety of 1.3 would be required under operating conditions.

Heaps, tailings, or other cyanidated material would have to be detoxified at closure (or during periods of prolonged inactivity) to effluent levels of less than 0.2 mg/l weak acid dissociable cyanide, pH between 6.0 and 8.5, and metal levels less than the maximum contaminant level. Post-closure discharges would have to achieve levels acceptable to the state and the U.S. Environmental Protection Agency.

Stability, Grading, and Erosion Control. Erosion would have to be controlled so that soil loss would not exceed 2 tons/acre/year. All excavations (roadcuts, drillsites, etc.) Would have to be recontoured approximately to the original contour. Recontoured waste rock and spent ore would be graded to no steeper than 3h:1v.

Pit Backfilling and Reclamation. The regulations would exempt operations from backfilling only where backfilling is determined to be environmentally unsound or unsafe.

Financial Guarantees (Bonding). Reclamation bonding requirements would be the same as described for Alternative 3. But bonding would be expanded to cover unplanned events such as spills or facility failures.

Inspection and Monitoring. BLM would be required to inspect all operations at least four times a year. Operators would be required to hire independent third parties to conduct environmental monitoring. BLM would be required to take samples during inspections to verify the results of the monitoring program.

Penalties for Noncompliance. The penalty system for noncompliance would be the same as under Alternative 3 except that civil penalties would have to be assessed. If BLM observes a noncompliance, it would have to issue a notice of noncompliance and assess a fine. Operators with unresolved noncompliances could have future permits blocked until the noncompliance is resolved.

Appeals Process. The appeals process would be the same as described for Alternative 3 except that all decisions would be *automatically stayed from effect* during consideration of the appeal unless a written request for implementation is granted by the relevant reviewing official (either the state director or the Interior Board of Land Appeals).

Implementation. The cost for BLM to administer the regulatory program under Alternative 4 would be about twice the cost of implementing the existing regulations.

Alternative Summary Tables

The following two tables summarize and compare the four alternatives by regulatory issue. Table 2-1 describes the alternatives for each of the regulation issues. Table 2-2 describes the alternatives for the performance standards issue, with a breakdown for each environmental or operating component. The numeric notation in the left column shows where the specific language on this subject can be found in the proposed regulations under Alternative 3.

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Table 2-1. 3809 Regulation Alternatives Summary by Provision

Regulation Issue	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Casual Use Definition [3809.5]	Activities resulting in only negligible surface disturbance and not involving mechanized earthmoving equipment, explosives, or vehicle use in areas closed to off-road vehicles. Interior Board Land Appeals has recently ruled that suction dredges are not casual use.	Not applicable.	Regulations specify that suction dredges would not be casual use. BLM would not require a Notice for < 4-inch intake with a state permit. BLM could designate in land use plans recreational mining activity levels that would require either a Notice or a Plan.	For all activities other than claim staking the operator must consult with BLM to determine if the activity is casual use or if a Plan is required.
Definition of Project Area [3809.5]	A tract of land upon which operations are conducted. Includes the area required for building or maintenance of roads, transmission lines, pipelines, or other means of access. Project area may include one or more mining claims, but claims must be under one ownership.	Would not apply to most operations. Exclusive-use access roads, powerlines, pipelines, etc. would require a rights-of-way from BLM.	Change would specify that the mining claims involved in a project might be owned by different parties.	Same as Alternative 3, except the project area would have to be described by metes and bounds or legal description. BLM must approve the project area boundary.
Definition of Public Lands (Lands where the regulations would apply) **[3809.5]**	BLM-administered lands subject to the Mining Law. Does not include lands where only the minerals or surface is federal, except that amendments to the Stock Raising Homestead Act mandate BLM involvement when surface owner does not consent to mineral development.	No change from current definition.	Expand definition to include lands where the mineral estate is federal, subject to the Mining Law, and the surface estate private (i.e. Stock Raising Homestead lands).	Same as Alternative 3.

Table 2-1. 3809 Regulation Alternatives Summary by Provision

Regulation Issue	**Alternative 1:** **Existing Regulations** **(No Action)**	**Alternative 2:** **State Management**	**Alternative 3:** **Proposed Regulations** **(Preferred Alternative)**	**Alternative 4:** **Maximum Protection**
***Unnecessary or Undue Degradation* Definition [3809.5]**	Prudent operator standard. Follow "usual, customary, and proficient" measures. Mitigate impacts. Comply with environmental laws. Perform reclamation. Do not create a nuisance.	Compliance with state programs for regulating mining would be considered prevention of unnecessary or undue degradation as required by Federal Land Policy and Management Act.	Replace the prudent operator standard with requirement to comply with performance standards. Activity must be reasonably incident to prospecting, mining, or processing operations.	Same as Alternative 3 except best available technology and practices must be used.
Notice vs. Plan of Operations Threshold [3809.11]	Surface disturbance less than 5 acres per calendar year requires a Notice. Plan required for more than 5 acres a year of disturbance or for any activity above casual use in special status areas such as areas of critical environmental concern, California Desert Conservation Area, wild and scenic rivers, wilderness areas, and areas closed to off-road vehicles.	Filing a Notice or Plan with BLM is not required. State would handle all permitting of mineral activities on BLM lands.	Same as Alternative 1, plus a Plan is always required for leaching operations or chemical use, in national monuments, in segregated or withdrawn areas, and on sensitive lands identified through land use planning. - OR - Use the Forest Service approach: determination as to Notice or Plan based on the potential for significant disturbance evaluated on a case-by-case basis.	Eliminate Notice provision. All disturbance greater than casual use would require a Plan of Operations.
Mining Claim Validity, Existing Rights, and Mine Economics [3809.100]	Not addressed in 3809 regs. Validity exams required before Plan approval in wilderness areas per the 8560 regulations. BLM has the *option* of determining valid existing rights before approving a Plan in segregated or withdrawn areas.	No Change. BLM always has the option of examining any mining claim at any time.	Add *requirement* that validity exams be conducted to determine valid existing rights before approval of Plans in areas withdrawn from operation of the mining laws except for some lands in Alaska. Discretion to perform validity exams for segregated lands.	Same as Alternative 3 but an economic feasibility study is required for all Plans on all lands. Economically unfeasible Plans of Operations would not be approved.

Table 2-1. 3809 Regulation Alternatives Summary by Provision

Regulation Issue	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Common Variety Minerals [3809.101]	Not addressed in 3809 regs. Policy provides for holding escrow during operations if materials to be mined may be of a common variety and subject to payment of fair market value.	No change.	Regulations would provide for holding escrow during operations if materials to be mined may be of a common variety and subject to payment of fair market value.	Plans not approved and mining not allowed until classification of material to be mined has been resolved through a common varieties determination.
State and Federal Government Coordination [3809.201 - .204]	Memorandums of understanding in each state provide for coordination for review, approval, bonding, and monitoring of operations. State may have lead for program. Most restrictive requirements apply.	States would regulate all activity on BLM lands. BLM would periodically evaluate the state program to determine if it is preventing unnecessary or undue degradation. BLM would continue to decide which areas are open or closed to mining through the land use planning and withdrawal processes.	When requested, BLM *must* give states the lead where state program is at least as stringent as BLM requirements. BLM must concur on Plan approvals. BLM retains inspection and enforcement option and NEPA, NHPA, Tribal Govt-Govt coordination and T&E species responsibilities.	BLM has the lead role on BLM lands and would coordinate with the states so that the more stringent regulations (federal or state) would apply to the project.
Applying Regulation Changes to Existing Operations [3809.300] [3809.400]	Not applicable.	Existing activity could continue according to state requirements.	Existing Notices would expire after 2 years unless bonded and extended. Existing approved Plans could continue as originally approved. Facilities added to existing Plans or modifications made to existing facilities would have to comply with the regulations unless shown not feasible for environmental, safety, or technical reasons. Pending Plans must comply with the new regulations unless the environmental assessment or draft EIS has already been released.	Notices expire in 2 years and must be reclaimed or replaced by Plans. Existing and pending Plans must comply with the new regulations as follows: (1) Within 180 days the operator would have to file a modified plan. (2) BLM may grant exceptions from specific requirements for economic, environmental, safety, or technical reasons. Facilities added to existing Plans must comply with the regulations unless shown not to be feasible for environmental, safety, or technical reasons.

Table 2-1. 3809 Regulation Alternatives Summary by Provision

Regulation Issue	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Notice and Plan of Operations Contents and Processing [3809.301 - .313] [3809.401 - .412]	BLM review of Notices required in 15 calendar days. Plans, 30 days, with option of 60 more days. Open-ended time frame for Plans for NEPA, NHPA, and T&E species compliance.	Follow state program requirements for content and processing of activities. No BLM processing or decisions. BLM could comment to state on proposals, just as could any other potentially affected landowner	Time frames begin when a *complete* Notice or Plan is received. Review Plan for completeness within 30 *business* days. Notice time frames 15 *business* days. Plans approval after 30-day public review of bond calculation.	Same as Alternative 3 but for Plans only.
Performance Standards **[3809.420]** **(See detailed Table 2.2 on performance standards sub-issues)**	Prevent unnecessary or undue degradation. Follow requirements at 3809.1-3(d). Other requirements may be developed during project-specific review.	Based solely on the state standards and requirements.	Outcome-based standards with site-specific allowances. Use most appropriate technology and practices. Reasonable & customary sequence. Conform with land use plans. Includes BLM cyanide & acid rock drainage requirements.	Specify minimum national design standards for exploration, mining, and reclamation. Incorporate BLM cyanide and acid rock drainage policy requirements. Must conduct activities to prevent irreparable harm.
Financial Guarantee Requirements (Bonding) **[3809.500 - .599]**	Bonds required only for Plans at BLM's discretion. By policy, bonds limited to $1,000/acre for exploration and $2,000/acre for mining except for cyanide facilities or portions of operation with acid rock drainage potential, which must be bonded at actual estimated reclamation cost. Use state bonding programs to meet these requirements through agreement.	No BLM bonding. The state would set, hold, and administer financial guarantees according to state regulations.	Actual-cost bonding would be required for all Notices and Plans. Financial guarantee must cover 100% of the reclamation costs. Equivalent state bonding instruments redeemable by the Secretary could be used to meet the requirements. State bond pools and state-acceptable corporate guarantees allowed.	Same as Alternative 3 except bonding would be expanded to cover unplanned events such as spills or facility failures.

Table 2-1. 3809 Regulation Alternatives Summary by Provision

Regulation Issue	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Inspection and Monitoring [3809.600]	Operator must allow BLM to inspect operations. Policy is for inspections 4 times annually where cyanide is used or significant potential for acid rock drainage and twice annually for all other operations. Monitoring programs are developed during Plan review. The operator conducts environmental testing (water, air, soil, etc.) and submits the results to BLM. BLM may take check samples during inspections.	States would conduct inspection and monitoring programs.	Same as Alternative 1. Add: Mandate current policy of inspections four times annually where cyanide is used or the potential exists for acid rock drainage. Upon prior notification to BLM, in certain circum-stances, may allow citizens to accompany an inspector of a mining operation.	Same as Alternative 3. Operators would be required to hire independent third parties to conduct environmental monitoring. BLM would be required to take check samples during inspections.
Type and Adequacy of Penalties for Noncompliance [3809.700]	BLM issues Notices of Noncompliance and Record of Noncompliance. Federal injunctions and criminal prosecution may be used.	State enforcement and penalty programs would be used. BLM would not issue separate penalties. Other agencies would still enforce other laws using their statutory authorities.	Same as Alternative 1. Add: BLM would issue discretionary administrative penalties, suspensions, revocation of Plan approval, and nullification of Notice for failure to comply with orders.	Same as Alternative 3 except enforcement orders and penalties would be mandatory. Operators with unresolved noncompliance could have future permits blocked.
Appeals Process [3809.800]	BLM decisions must be appealed within 30 days. Operator must appeal to BLM state director, then to the Interior Board of Land Appeals (IBLA). Third-party appeals of BLM decisions are made to IBLA. BLM's decision is in full force and effect during an appeal, unless IBLA grants a written request for a stay.	Generally there would be no appeals since normally a federal action would not be involved. Where BLM takes an action under some other regulations, such as for rights-of-way, the decision could be appealed under the appeals rules for that program.	Both operator and third-party appeals would be to the IBLA. State director appeals could be provided by a separate rule-making. All decisions would be in full force and effect unless a written request for a stay is granted by the reviewing entity (either state director or IBLA).	Same as Alternative 3 except that all decisions would be automatically stayed from effect during consideration of the appeal unless a written request for implementation is granted by the reviewing official (either state director or IBLA).

Table 2-2. 3809 Regulations Summary of Performance Standards by Alternatives

Performance Standards Sub-Issues	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
General Performance Requirements [3809.420]	Prevent unnecessary or undue degradation. Follow requirements at 3809.1-3(d). Other requirements may be developed during project-specific review.	The only specific performance standards would be those in state regulations.	Specify use of most appropriate technology and practices. Include outcome-based performance standards that allow for site-specific conditions.	Specify minimum national design standards for operations. Activities could not cause irreparable harm, which would mean to permanently impair the land's productivity.
Land Use Plans	Not addressed.	Not addressed.	Consistent with the Mining Law, operations and postmining land use must comply with the land use plan.	Same as Alternative 3. Land use plans would be used to determine resource conditions that constitute irreparable harm.
Surface and Ground Water Protection	All operators must comply with federal and state water quality standards. Exploration operations and drill hole plugging are not specified.	Same as Alternative 1. State water protection programs and other federal water protection requirements would still apply to operations on BLM lands.	Pit water quality must not endanger wildlife, public water supplies, or users. To meet this standard, operation and reclamation practices that minimize water pollution and changes in flow would be used in preference to water treatment or replacement. All drill cuttings and mud must be contained onsite. All exploration drill holes must be plugged to prevent mixing of waters from aquifers, impacts to beneficial uses, downward water loss, or upward loss from artesian conditions. Bore holes must be plugged on the surface to prevent direct inflow of surface water and to eliminate the open hole as a hazard.	Same as Alternative 3 with these additional criteria. Pit water quality must not exceed the acute toxicity standard for metals so as not to endanger wildlife, public water supplies, or users. Operators must not rely for more than 20 years on water treatment, maintenance, or replacement of lost flow to meet this standard. All drill cuttings and mud must be contained onsite using sumps or portable tanks. All exploration drill holes must be plugged from the bottom to no more than 10 feet of the surface with bentonite or a similar compound to prevent mixing of waters from aquifers, impacts to beneficial uses, downward water loss, or upward loss from artesian conditions. The upper 10 feet must be plugged with cement.

Table 2-2. 3809 Regulations Summary of Performance Standards by Alternatives

Performance Standards Sub-Issues	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Wetlands and Riparian Area Protection	Not specified. State and 404 permits (from the Army Corps of Engineers) must be acquired for dredging or filling in U.S. waters.	Same as Alternative 1.	Same as Alternative 1 with specific site-selection criteria added: Operator must: (1) avoid locating operations in wetland and riparian areas where possible, (2) minimize impacts to wetlands and riparian areas, and (3) mitigate damage to wetland and riparian areas through measures such as restoration or offsite replacement.	Same as Alternative 1 with specific site selection and mitigation criteria: Operator must: (1) avoid locating operations in wetland and riparian areas where possible, (2) minimize impacts to wetlands and riparian areas, and (3) mitigate damage to wetland and riparian areas by restoring to proper functioning condition within 10 years after operations or offsite replacement at a ratio of at least 1.5 acres for every acre disturbed.
Soil or Growth Media Handling	Where reasonably practicable, topsoil must be saved and reapplied to disturbed area after reshaping has been completed.	Topsoil must be salvaged and reapplied according to state standards.	Topsoil or other growth media must be removed, segregated and preserved for later use in revegetation during reclamation. If such topsoil or growth media are poor quality, other strata or more suitable growth media must be removed, segregated, or preserved in a like manner.	Same as Alternative 3. Topsoil or other growth media must be removed from the lands disturbed by operations, segregated by soil horizon, and preserved for later use in revegetation during reclamation.
Revegetation Requirements	Where reasonable and practicable, disturbed areas must be revegetated. Revegetation is to provide a diverse vegetative cover. Revegetation is a component of the requirement to rehabilitate wildlife habitat. Prohibition on creation of a nuisance used to address noxious weed control.	Disturbed areas must be revegetated where reasonable and practicable according to state standards.	Same as Alternative 1 with more specifics on outcome. All disturbed lands must be revegetated to establish a stable and long-lasting cover that is self-sustaining and comparable in both diversity and density to preexisting natural vegetation. Use native species to the extent feasible and establish success according to schedule in reclamation plan. Operations must prevent and control noxious weed infestations.	Same as Alternative 3 with some more design specifics. Canopy cover must be at least 90% that of adjacent undisturbed lands with similar elevation, slope, and aspect at the same time of year. Only native species may be used. Operations, including revegetation, must prevent the introduction of noxious weeds or *eliminate* any existing infestations.

Table 2-2. 3809 Regulations Summary of Performance Standards by Alternatives

Performance Standards Sub-Issues	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Fish and Wildlife Protection and Habitat Restoration	The operator must take needed action to prevent harm to threatened and endangered species and their habitat that might be affected by operations. Reclamation must include rehabilitating fisheries and wildlife habitat.	Use state standards for protecting fish and wildlife The taking of a threatened and endangered species or migratory birds would still be prohibited under the Endangered Species Act and the Migratory Bird Treaty Act.	Same as Alternative 1. Operators must minimize disturbances and adverse impacts to fish, wildlife, and related environ-mental values. All processing solutions, reagents, or mine drainage toxic to wildlife must be fenced or netted to prevent wildlife access.	Same as Alternative 3 The operator must minimize disturbance and within 10 years restore any disturbed habitat to proper functioning premining condition. The operator must not jeopardize special status species, causing them to be listed as threatened or endangered.
Protection of Cultural Resources	National Historic Preservation Act Section 106 process used to develop mitigation for cultural resources found before Plan approval. Operators cannot knowingly disturb, alter, injure, or destroy any historical or archaeological site, structure, building, object, or cultural site discovered during operations. Operators must immediately notify BLM of any cultural resources found during operations and must leave such discoveries intact. BLM has 10 working days to protect or remove the discovery at the government's cost, after which operations may proceed.	State standards would be used for protecting cultural resources.	Same as Alternative 1, except 20 working days instead of 10 would be allowed for data recovery. BLM would determine who bears the cost of recovery on a case-by-case basis.	Same as Alternative 1, except no time limit would be set on data recovery of significant cultural resources. Operator would bear the cost of site recovery.

Table 2-2. 3809 Regulations Summary of Performance Standards by Alternatives

Performance Standards Sub-Issues	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Protection of Paleontological Resources	Operators cannot knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains. Operators must immediately notify BLM of any paleontological resources discovered during operations and must leave such discoveries intact. BLM has 10 working days to protect or remove the discoveries at the government's cost, after which operations may proceed.	State standards would be used to protect paleontological resources.	Same as Alternative 1, except 20 working days instead of 10 would be allowed for data recovery. BLM would determine who bears the cost of recovery on a case-by-case basis.	Same as Alternative 1, except no time limit on data recovery of significant paleontological resources. Operator would bear the cost of site recovery.
Protection of Cave Resources	Not specified.	Use state standards for protecting cave resources.	Inventories and mitigation plans would be required before disturbance for cave resources. Operators must immediately notify BLM of any significant cave resources found during operations and leave such discoveries intact. BLM has 20 working days to protect a discovery, after which operations may proceed. BLM would determine who bears the cost for protecting cave resources.	Same as Alternative 3, except there would be no time limit on data recovery of significant cave resources Operator would bear the cost of cave resource protection.
American Indian Traditional Cultural Values, Practices, and Resources	Not specified in the regulations. Consultation with American Indians is used to develop mitigation on a case-by-case basis.	State standards would be used to protect American Indian resources. BLM would assist American Indians in consulting with states on a specific project's impacts.	Consultation with American Indians is specified as part of the Plan review process. Consultation would be used to develop mitigation on a case-by-case basis where mitigation is possible.	Plan approval in special status areas, designated through the land use planning process as containing American Indian traditional cultural values, would require concurrence by affected American Indians.

Table 2-2. 3809 Regulations Summary of Performance Standards by Alternatives

Performance Standards Sub-Issues	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Roads and Structures	Minimize surface disturbance, use existing access where practical, maintain safe design, follow natural contour, minimize cut and fill. Operators must consult with BLM for roadcuts greater than 3 feet on inside edge. All structures must be built and maintained according to state and local codes. Structures are addressed in separate rules at 3715.	Roads would be built and maintained according to state standards. Same as Alternative 1 for structures on BLM lands.	Same as Alternative 1.	Roads built for access, haulage, service, or exploration must not have maximum sustained grade greater than 10%, with short pitches of less than 300 feet to take advantage of topography not to exceed a 12% grade. Diagonal drainage barriers must be placed as follows: Grade % Max. Spacing (ft) 0 - 2 200 3 - 8 150 9 -12 80 All roads must be reclaimed to approximately original contour. All structures must be built and operated according to codes and removed at the end of operation.
Handling of Potentially Acid-Forming, Toxic, or Other Deleterious Materials	Reclamation must include measures to isolate, remove, or control toxic or deleterious materials. Other requirements imposed would be based on site-specific review according to BLM policies.	Potentially acid-forming material must be managed according to state requirements. No discharges could exceed state and federal effluent limits under the Clean Water Act or state water quality acts.	Incorporates the requirements of the acid rock drainage policy. Static or kinetic testing must be used. Procedures must be fully integrated with operational procedures, facility design, and environmental monitoring programs. Control must focus on prevention or control of the oxidation of acid-forming minerals. Capture and treatment of acid rock drainage or other undesirable effluent to the standard is required if source controls and migration controls do not prove effective. Effluent treatment could be used only after source control has been employed.	Same as Alternative 3 with more design specifics and suitability criteria. BLM could set criteria to determine if deposits are unsuitable for mining because of acid-forming and acid-neutralizing mineral content, climate, and control technologies. Mining of materials exceeding these criteria would not be approved. Potentially toxic mine wastes (pond sludge, lab wastes) could not be disposed of on BLM-managed lands. Plans proposing treatment periods longer than 20 years to meet standards are not acceptable and would be denied.

Table 2-2. 3809 Regulations Summary of Performance Standards by Alternatives

Performance Standards Sub-Issues	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Leaching and Processing Operations and Impoundments	Reclamation must include measures to isolate, remove, or control toxic or deleterious materials. Other requirements imposed would be based on site-specific review according to BLM policies	Leaching and processing operations must be designed, built, and operated according to state standards.	Includes BLM's cyanide policy: Cyanide facilities must be able to contain at least the maximum operating solution with capacity for the 100-year, 24-hour storm event, including snowmelt events and expected draindown from heaps during power outages. Secondary containment must be built for vats, tanks, or recovery circuits adequate to prevent the release of toxic solutions. Heaps and other solution containment structures must be monitored for leaks. Cyanide solution and heaps must be neutralized or detoxified upon release to the environment, temporary closure, or at final reclamation. Operations must not cause wildlife mortality. Exposed cyanide solutions would be fenced and covered to prevent access by the public, wildlife, and livestock. Neutralization may be used in lieu of fencing tailings impoundments. Warning signs must be posted near any perceived water sources that contain cyanide or other leachate.	Same as Alternative 3 except probable maximum precipitation event standard. Also with more design specifics. Build secondary containment system around vats, tanks, or recovery circuits adequate to contain 110% of the maximum contents. All leach pads must employ at least two synthetic liners with drainage layer over at least 24-inches of compacted clay. Each synthetic liner must be at least 40 mils thick. The clay liner must be compacted to a permeability of less than $1X10^{-7}$ cm/sec. Leak detection and recovery systems must be built for heaps and other solution containment structures. Ore heap and leach pads must have a minimum factor of safety of 1.3 and be stable during construction. Cyanidated material must be detoxified at temporary or final closure to less than 0.2 mg/l WAD cyanide, pH between 6.0 and 8.5, and metal levels less than the MCLs. Post-closure discharges must achieve levels acceptable to the state and EPA.

Table 2-2. 3809 Regulations Summary of Performance Standards by Alternatives

Performance Standards Sub-Issues	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Stability, Grading, and Erosion Control	Reclamation must include measures to control erosion, landslides, and water runoff.	Stability, grading, and erosion control must be achieved according to state regulations.	Erosion must be minimized during all phases of operations. All disturbed areas must be graded or otherwise engineered to a stable condition to minimize erosion and facilitate revegetation. All areas must be recontoured to blend in with the premining natural topography to the extent feasible.	Erosion must be controlled so that soil loss does not exceed 2 tons/acre/year. All excavations (roadcuts, drillsites, etc.) Must be recontoured to about the original contour. Recontoured waste rock and spent ore must be graded to no steeper than 3h:1v.
Pit Backfilling and Reclamation	Not specified. Stable highwall might be left where required to preserve evidence of mineralization.	Backfilling or reclaiming of mine pits would comply with state requirements.	BLM would determine degree of backfilling required, if any, from a site-specific operator demonstration of infeasibility based on economic, environmental, and safety considerations. Mitigation would be required for pit areas that are not backfilled.	Same as Alternative 3, with the only exemption from backfilling being where determined environmentally unsound or unsafe.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
MINERAL EXPLORATION AND DEVELOPMENT (OVER 20 YEARS)				
Recreational Mining	Current levels not known.	No change	<-5% change in activity	<-5% change in activity
Small Exploration	17,000 Notices	17,800 Notices (+5%)	16,200 Notices (-5%)	13,600 Plans (-20%)
Large Exploration	1,200 Plans	1,300 Plans (<+5%)	1,100 Plans (<-5%)	1,000 Plans (-15%)
Small Placer	6,000 Notices	6,300 Notices (+5%)	5,700 Notices (-5%)	5,100 Plans (-15%)
Large Placer	1,450 Plans	1,500 Plans (<+5%)	1,400 Plans (<-5%)	1,300 Plans (-10%)
Small Open Pit	1,300 Notices	1,400 Notices (+5%)	1,200 Notices (-5%)	1,000 Plans (-25%)
Large Open Pit	800 Plans	850 Plans (<+5%)	750 Plans (-5%)	600 Plans (-30%)
Small Undgd Mning	800 Notices	1,150 Notices (+5%)	750 Notices (-5%)	650 Plans (-15%)
Large Undgd Mining	90 Plans	95 Plans (<+5%)	85 Plans (<-5%)	80 Plans (<-10%)
Industrials Mining Operations	300 Notices 100 Plans	320 Notices (+5%) 110 Plans (+5%)	260 Notices (<-5%) 90 Plans (<-5%)	250 Plans <5 acres (-5%) 85 Plans >5 acres (-5%)
Custom Milling Operations	170 Notices 80 Plans	175 Notices (+5%) 85 Plans (+5%)	165 Notices (-5%) 75 Plans (-5%)	160 Plans <5 acres (-10%) 70 Plans >5 acres (-10%)
Notices and Plans/Year	1200 Notices 200 Plans	1300 Operations < 5 acres 210 Operations > 5 acres	1150 Notices 190 Plans	0 Notices 1100 Plans
Acres Disturbed/Year	12,500	13,100 (+4.8%)	11,800 (-5.6%)	9,800 (-21.6%)
HAZARDOUS MATERIALS AND WASTE MANAGEMENT				
Mine Waste	Mine waste might not be reclaimed properly and could cause contamination.	Same as Alternative 1, but BLM might not be aware of mine waste left on site.	Mine waste could be reclaimed to control potential contamination.	Mine waste (certain types of pond sludge, lab wastes, etc.) would be removed from public lands.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
CLIMATE AND AIR QUALITY				
Climate and Air Quality	No impacts to climate. Impacts to air quality would continue at current levels. Direct impacts include noise, dust, gaseous, and particulate emissions, exhaust from blasting, extracting, crushing, milling, and hauling. Most impacts would exist only during the life of operations. All operations would continue to comply with all air quality laws, standards, and implementation plans.	Similar to Alternative 1. A cumulative increase in overall emissions could result from a 5% increase in mining activity. All operations would continue to comply with local, state, tribal, and federal air quality laws, standards, and implementation plans.	Similar to Alternative 1. A cumulative decrease in overall emissions could result from a 5% decrease in mining activity. All operations would continue to comply with local, state, tribal, and federal air quality laws, standards, and implementation plans.	Similar to Alternative 1. A cumulative decrease in overall emissions could result from an 15% decrease in acreage disturbed and a 30% reduction in open pit mining. All operations would continue to comply with local, state, tribal, and federal air quality laws, standards, and implementation plans.
WATER RESOURCES				
Water Quality	Mining deeper into the sulfide ore zone could result in water quality problems with pit lakes and migration of contaminants into aquifers. Potential acid rock drainage and leachate might enter surface or ground water. Tailings and process pond runoff or leakage could enter surface water and cause heavy metals contamination. Character of local aquifer could change due to physical removal and replacement of geologic material in backfilling.	Variable, depending on specific state programs.	Reduced risk of ground water quality degradation through backfilling, grouting of exploration holes, and the use of source controls for handling acid-forming materials. Improved requirements for baseline data collection and increased ground water monitoring programs would provide early detection and mitigation of potential impacts.	This alternative has the lowest potential for water quality impacts. Prohibition against permanent water treatment would require developing effective source controls to prevent the degrading of water quality. Decreased level of mining would reduce the potential for impacts to water quality. Pit lake impacts on water quality would decline due to pit backfilling and requirement that pit lakes not exceed acute toxicity standards. Design controls would reduce the risk of contamination from leaks or facility failures.

Alternatives Considered but Eliminated

The alternatives considered in detail represent a reasonable range of alternatives to address the issues recognized by scoping. All of the major technical and regulatory issues are considered in at least one of the alternatives that are analyzed in detail. Other issues, such as mining law reform, cannot be resolved through rulemaking and were not used in developing alternatives.

Other alternatives considered but eliminated from detailed analysis include one that would consider funding levels or mandating complete funding of the existing regulations and one requiring complete restoration to premining conditions.

The complete funding alternative was eliminated as redundant. The EIS analysis needs to assume the complete implementation of alternatives to fully consider the potential environmental impacts of an alternative's being selected. The analysis of the existing regulations (Alternative 1) is based upon complete implementation of that alternative, which implies complete funding. Complete implementation is also assumed for Alternatives 2, 3, and 4 when assessing potential impacts. The EIS does estimate the relative cost to implement each alternative. Although regulatory programs are often underfunded, assuming complete implementation when presenting the impacts allows the public and the decisionmaker to see the relative cost versus benefits that might be achieved under the regulatory scheme of each alternative.

In developing a preferred alternative for consideration in the final EIS, two approaches may be taken if adequate funding appears not to be likely. The alternative may be modified to reduce implementing costs, or it may remain unchanged with the recognition that complete implementation would require adequate funding.

The alternative of requiring total restoration of disturbed lands to premining conditions was considered but eliminated from detailed analysis. Complete restoration would require restoring the premining topography with the same habitat composition and productivity levels. In contrast, reclamation requires attaining a stable and productive land area though not necessarily replacing the same predisturbance habitat or exact topography. Both the technical and economic difficulties of attaining complete restoration would make the most mining operations on public lands infeasible. Complete restoration would conflict with BLM's multiple use mandate and would offer little commensurate environmental benefit over alternatives with aggressive reclamation requirements.

The alternative of adopting ISO 14000 standards was also considered but eliminated from detailed analysis. Established by the International Organization for Standardization, ISO 14000 standards provide a framework a company can use to incorporate a voluntary environmental management system (EMS) into its operations. Integrating an EMS into a company's operations can offer guidelines and opportunities for continuous improvement of the company's compliance and performance with environmental regulations. However, it is important to note ISO 14000 standards do not replace environmental regulations and compliance is still necessary within a company's EMS framework. Consequently, ISO 14000 standards could be voluntarily adopted by a company within any of the alternatives analyzed in detail in this EIS and do not need to be considered separately.

Summary of Potential Environmental Impacts

Table 2-3 summarizes the potential environmental impacts for each alternative. A detailed description of impacts is presented in Chapter 3.

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Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Water Quantity	Dewatering could cause some streams and springs to dry up and increase stream flow in other streams, altering stream morphology and character. Some streams might be diverted from channels and rerouted.	Same as Alternative 1.	Dewatering effects would continue about the same as under Alternative 1.	Dewatering effects would be similar to Alternatives 1 and 3, but possibly reduced with fewer operations.
SOILS				
Acres of Disturbance	12,500 acres/year	13,100 acres/year	11,800 acres/year	9,800 acres/year
Soil Salvage and Reclamation Availability	Soil salvage practices not adequate to reestablish soil profile.	Same as Alternative 1.	Improved growth medium, salvage practice improved but not adequate to reestablish soil profile.	Segregating topsoil and subsoil would improve reclamation success, including reestablishing soil profile.
Post-Reclamation Erosion Control and Soil Loss Potential	Stability requirement would generally limit soil loss, and emphasis on revegetation would also reduce erosion.	Same as Alternative 1.	Stability requirement would generally limit soil loss. Greater emphasis on revegetation would also reduce erosion	Regrading to 3h:1v slopes and increased revegetation requirements would reduce soil loss.
VEGETATION				
Acres of Vegetation Disturbed	12,500 acres/year	13,100 acres/year	11,800 acres/year	9,800 acres/year
Reclamation Timing and Diversity-Density of Reclaimed Areas	Quick reestablishing of vegetative cover (except in Alaska), long-term increase in diversity and use of native species.	Same as Alternative 1.	Quick reestablishing of vegetative cover would result in more timely reestablishing of a diverse native cover.	Would ensure establishing of native cover to at least 90% of adjacent undisturbed lands within 10 years.
Noxious Weed Infestation of Disturbed Areas	Long-term improvement in weed control as policies are implemented.	Lack of comprehensive effort to control weeds would likely result in increased infestations.	Greater emphasis on weed control would reduce infestations.	Mandatory weed control would reduce or eliminate weed infestations resulting from mineral activity.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
RIPARIAN-WETLAND RESOURCES				
Acres of Riparian-Wetland Disturbed (Placer Mining Only)	1,180 acres/year	1,210 acres/year	1,150 acres/year	1,040 acres/year
Mitigation/ Replacement and Protection	Nature, duration, and extent of riparian-wetland disturbance would continue as in past. Mitigation not required for BLM-defined riparian-wetland habitat but generally conducted in conjunction with fish and wildlife rehabilitation. Mitigation usually consists of creating new areas. Replacement areas would not restore lost function for many years. Mitigation would also not address problems of temporal or spacial loss of function.	Nature of riparian-wetland disturbance would be similar to Alternative 1. Impacts to riparian-wetland areas meeting BLM criteria would likely not be mitigated unless state has specific requirement to do so.	Where ore extraction could not avoid disturbance, the nature of riparian-wetland disturbance would be similar to other alternatives. Less disturbance would result from activities other than ore extraction (i.e. access, waste handling, and processing). Lost or degraded riparian-wetland areas would have to be returned on an acre-for-acre basis to proper functioning condition (PFC). BLM would set recovery time for PFC. In the long term no more riparian-wetland habitat or function would be lost. Mitigation would not address problems of temporal or spacial loss of function. BLM's ability to require detailed baseline information on riparian-wetlands could help increase success rate of mitigation through improved design.	The nature of unavoidable disturbance would be similar to Alternative 3. Disturbance other than that needed to extract ore would be similar to Alternative 3. The overall disturbance might be substantially less than other alternatives due to irreparable harm standard and time requirement for restoration. Lost or degraded riparian-wetland function would have to be returned to PFC, on a 1.5 acre restored per acre disturbed basis. The time requirement to meet PFC, the greater restoration:disturbance mitigation requirement, and ability to require baseline data would offset the uncertain nature of mitigation and loss of temporal and spacial function. If PFC is not predicted within restoration time frame, BLM could deny proposal to mine.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
AQUATIC RESOURCES				
Habitat Loss or Degradation	26 miles/year of stream habitat would be lost or degraded by placer mining. The removal of riparian vegetation would result in long-term loss or degradation of aquatic habitat; 25 to 50+ years or until riparian-wetland areas reestablished to proper functioning condition. Aquatic communities could be displaced by artificially increased streamflow during dewatering and insufficient flows following mining. Increased sedimentation and turbidity would be expected over the long term. Contaminants could threaten aquatic life because of need for perpetual treatment. Suction dredging could continue to degrade aquatic habitat and cause increased mortality of juvenile fish.	27 miles/year of stream habitat would be lost or degraded by placer mining. Nature, duration, and extent of impacts to aquatic habitat and communities would be similar to Alternative 1. Some states such as California might require that aquatic habitat be restored to premine condition. In some states (e.g. California) suction dredging impacts to aquatic habitat and communities would be reduced or avoided because of the permit requirement.	25 miles/year of stream habitat would be lost or degraded by placer mining. Requirement to minimize disturbance to aquatic resources would slightly lower habitat disturbance. Nature and extent of habitat disturbance would be similar to Alternatives 1 and 2. The duration of habitat disturbance might be slightly less because of BLM's ability to set the time frame for riparian-wetland recovery. Impacts of suction dredging would be reduced or avoided.	23 miles/year of stream habitat would be lost or degraded by placer mining. Nature of impacts to aquatic resources would be similar to Alternative 3. Duration and extent of impacts could be greatly reduced by the habitat restoration time requirement. If aquatic and riparian-wetland habitats are not expected to be restored within 10-year restoration time frame, BLM might deny the proposal to mine. Offsite riparian-wetland mitigation at a ratio of 1.5 to 1 would help offset the temporal and spacial functional loss of riparian-wetlands. Runoff, seepage of contaminants would not as greatly threaten aquatic life because of BLM's ability to designate acid-producing deposits as unsuitable for mining.
Fish Populations	Fish populations, including sensitive species, would continue to be displaced, injured, and killed. Level of impact would vary by state.	Impacts to fish, including sensitive species, would be similar to Alternative 1.	Impacts to fish, including sensitive species, would be similar to Alternative 1, except for areas immediately outside the ore body, where habitat disturbance could be minimized.	Common species would continue to be affected as under Alternative 1. Displacement, injury, and mortality of sensitive species should be reduced or avoided.

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Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
WILDLIFE AND THREATENED AND ENDANGERED SPECIES				
Habitat Loss or Fragmentation	12,500 acres lost per year; fragmentation would continue.	13,100 acres lost per year; fragmentation would continue.	11,800 acres lost per year; fragmentation would be lessened; more emphasis on reestablishing a native cover.	9,800 acres lost per year. Greatest emphasis on minimizing fragmentation effects, reestablishing vegetative cover to at least 90% of adjacent undisturbed lands within 10 years. Mineral activity on some sites might be disallowed if premining conditions could not be achieved within 10 years.
Habitat Quality	Continued degradation from noise, introduction of exotic species, pollution, transmission lines, and other factors would stress wildlife populations.	Same as Alternative 1.	Requirement to minimize wildlife habitat impacts would lessen degradation of habitat quality.	Emphasis on protecting habitat quality would greatly reduce habitat degradation. Mineral activity at some sites might be disallowed if premining conditions could not be achieved within 10 years
Population Levels	Loss of habitat and reduction of habitat quality would displace, injure, and result in increased mortality, including sensitive species. No impacts to threatened and endangered species. Locally some sensitive species could be affected.	Greater impacts from increased mineral activity. Otherwise, impacts would be the same as under Alternative 1.	Decrease in mineral activity would reduce impacts to wildlife populations. Greater emphasis on avoiding impacts to wildlife and habitats would reduce wildlife mortality, including mortality of sensitive species.	Greatest reduction in mineral activity would reduce impacts to wildlife populations. Greatest emphasis on avoiding impacts to wildlife and habitats would reduce wildlife mortality. Sensitive species would be given protection similar to threatened and endangered species. Mineral activity on some sites might be disallowed if premining conditions could not be achieved within 10 years.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
WILD HORSES AND BURROS				
Wild Horses and Burros	Herds could be displaced by noise, vehicular traffic, human presence, or loss of forage or water sources. Water sources could be lost by restricted access or dewatering. Sensitivity to activity would be most acute during spring foaling.	Similar to Alternative 1, but proportionately greater due to 5% overall increase in mine production.	Similar to Alternative 1, but proportionately less due to 5% overall decrease in mine production.	Similar to Alternative 1, but proportionately less due to overall decrease in production of up to 30% depending on type of mining. Adding provisions to land use plans to protect herd management areas by limiting use of heavy equipment, drilling, blasting, and other activities would benefit horses and burros.
LIVESTOCK GRAZING				
Livestock Grazing	Impacts would be small under all alternatives. Mining has affected an estimated 1/10 of 1% of animal unit months since 1981. Mining displaces livestock grazing by disturbing forage, water sources, or other range developments. Impacts could be mitigated; otherwise, the level of grazing would have to be reduced on the grazing permit or lease. After reclamation, some grazing might be reestablished.			
SPECIAL STATUS AREAS				
Types of Designated Special Status Areas in 3809 Regulations	Lands in the California Desert Conservation Area (CDCA), National Wild and Scenic River System, areas of critical environmental concern (ACECs), designated wilderness, and areas closed to off-road vehicle (ORV) use.	BLM 3809 regulations would not include special status areas.	Same as Alternative 1, plus areas designated in land use plans with unique, irreplaceable, or outstanding values; national monuments or conservation areas; and withdrawn areas or areas segregated in advance of a withdrawal.	Same as Alternative 3, plus lands used for traditional cultural practices, or containing traditional cultural resources would be added as special status areas.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Protection Level	Plans and bond required. Mining on lands within the CDCA, Wild and Scenic River System, and wilderness areas would have to meet the stated levels of resource protection or reclamation required by statutes.	Mining within the CDCA, Wild and Scenic River System and in wilderness areas would continue to have to meet the levels of resource protection or reclamation required by statutes establishing these areas. ACECs and ORV-closed areas would be protected as provided for by state regulatory programs.	Same as Alternative 1, except that land use plans would better protect special status areas that do not have stated levels of resource protection or reclamation required by statutes.	Suitability requirements and the requirement to prevent irreparable harm would protect the resources for which the special status areas were designated. Requirement for American Indian concurrence for activity in areas designated as valuable for traditional cultural resources would protect those areas and resources.
RECREATION				
Recreational Mining	No change from present.	Similar to Alternative 1.	Slight decline in participation.	Slight decline in participation.
Other Recreation Users	Mix of recreational opportunities would change. Primitive recreation opportunities would continue to decrease, while opportunities for more developed recreation would increase.	Similar to Alternative 1 but proportionately greater decrease in primitive recreation opportunities and increase in developed recreation would result from 5% overall increase in mining.	Similar to Alternative 1, but proportionately smaller decrease in primitive recreation opportunities and increase in developed recreation from 5% overall decrease in mining activity.	Similar to Alternative 1, but greater potential for preserving recreation opportunities at the primitive end of the spectrum would result from potential 30% decrease in mining. Developed recreation opportunities created by mining and increased access would be forgone.
VISUAL RESOURCES				
Visual Quality	No change from current conditions. In some locations severe visual effects would result.	Effects to visual quality would be more severe than under Alternative 1 because of less emphasis on scenic quality and small increase in activity.	Effects to visual quality would be less severe than under No Action because of stricter reclamation requirements and slight decrease in activity.	Effects to visual quality would be much less severe than under No Action because of greater emphasis on visual resources and lower level of activity.
VRM Compliance	Some projects would not meet VRM objectives.	VRM guidelines would not apply.	Some projects would not meet VRM objectives.	Projects would be likely to meet VRM objectives.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
PALEONTOLOGICAL RESOURCES				
Paleontological Sites	Low impacts from Notice-level activity. Plan-level activity would benefit paleontological sites due to discovery and inventory of previously unknown sites	Without BLM project review a net loss of site information would result.	Requirements for inventories and mitigation development before surface disturbance would reduce or possibly prevent most potential impacts. Increased recovery time would benefit paleontological resources in cases of incidental discovery.	Same as Alternative 3. Eliminating Notices and unrestricted data recovery time would virtually eliminate adverse impacts and might benefit acquisition of paleontological data.
CAVE RESOURCES				
Cave Sites	Notices, Plans, and current mining would have more indirect than direct impacts to caves.	Loss of cave resources from both Notice- and Plan-level activity.	Some reduction in impacts because of reduced activity and addition of inventory and mitigation requirements for cave resources in the regulations.	Greatest reduction in impacts because of moderate reduction in mineral activity and requirement that all disturbance above casual use undergo environmental review.
CULTURAL RESOURCES				
Historic Properties (Non-Traditional Cultural Properties)	3% of Notices would affect historic properties due to limited advance review of Notice-level activities. Plan-level operations would not affect historic properties due to advanced inventory, consultation, and mitigation development.	Increased impacts to cultural resources without BLM review, consultation, or mitigation.	Increased time frame for site recovery would reduce impacts to incidental discoveries.	Eliminating Notices would virtually eliminate impacts to historic properties because of advance inventory, consultation, and mitigation development, including operations on split-estate lands.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
Traditional Cultural Properties (TCPs)	Impacts would continue from Plan- and Notice-level operations. Some impacts would continue due to large size of most traditional cultural properties, making avoidance impractical as mitigation.	With increases in mining activity, impacts from Notice- and Plan-level activity would increase. Without BLM's inventory, consultation, and mitigation, impacts would increase.	Impacts to traditional cultural properties would decrease because of a slight decrease in mineral activity and greater proportion of plans requiring inventory, consultation with American Indians, and opportunity for mitigation.	Potential for impacts would be greatly reduced due to decreased activity. Eliminating Notices would greatly reduce impacts by requiring advanced inventory, consultation, and mitigation. Some residual impacts could still result because of the large size of some traditional cultural properties, making avoidance impractical as mitigation.
AMERICAN INDIAN RESOURCES				
Trust Resources	Potential for impacts from Notice-level operations would continue.	Potential for impacts would increase without BLM review of activity that might affect trust resources.	Probable reduction in impacts due to slight decrease in activity and increased proportion of Plans requiring consultation.	Reduction or elimination of impacts due to moderate decrease in activity and removal of Notice provision, therefore requiring consultation on all activity greater than casual use that might affect trust resources.
Traditional Cultural Practices and Resources	Some residual impacts could not be mitigated and would continue.	Increased impacts expected from lack of mandated consultation or mitigation development.	Decrease in impacts due to slight reduction in activity and increased amount of consultation and mitigation.	Substantial decrease in impacts due to moderate reduction in activity and required concurrence by American Indians before allowing disturbance on lands with traditional cultural resources.
Subsistence Resources	Potential for impacts from Notice-level operations would continue. Alaska National Interest Lands Conservation Act (ANILCA) would prevent impacts from Plan-level activity.	Increased potential for impacts from increased activity and lack of BLM reviews or approvals of mineral activity.	Less activity would decrease potential for impacts from Notice-level operations. ANILCA would prevent impacts from Plan-level activity.	Impacts from Notice-level operations would be eliminated. ANILCA would prevent impacts from Plan-level activity.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
SOCIAL CONDITIONS				
Small Miners	No effect	No effect	Potential for minor negative effect, due to greater restrictions on small operations.	Potential for minor to major effect if alternative employment must be found.
Communities	No effect.	Potential for minor benefits to mining-dependent communities due to slight increase in overall mining activity.	Potential for minor harm to mining-dependent communities due to slight decrease in overall mining activity.	Potential for significant adverse effect to mining-dependent communities, including declines in social well being due to potential for up to 30% decrease in overall mining activity.
Environmental Advocacy Groups	Would not favor; not enough resource protection.	Same as Alternative 1.	Would not favor; not enough resource protection.	Would favor this alternative.
General Public	Inconsistent with attitudes of increasing numbers of people that resources should receive more protection.	Same as Alternative 1.	Consistent with attitudes of increasing numbers of people that resources should receive more protection	Same as Alternative 3.

Table 2-3. 3809 Regulations Summary of Impacts by Alternative

Affected Resource or Activity	Alternative 1: Existing Regulations (No Action)	Alternative 2: State Management	Alternative 3: Proposed Regulations (Preferred Alternative)	Alternative 4: Maximum Protection
ECONOMIC CONDITIONS				
Total Annual Mineral Production Value	$1.82 billion	$1.91 billion (+5%)	$1.73 billion (-5%)	$1.30 billion (-30%)
Total Annual Employment	22,900	24,000	21,700	16,000
Total Annual Personal Income	$819 million	$860 million	$778 million	$573 million
Total Annual Industry Output (Includes Multiplier Effect of Mining Industry Expenditures)	$3.30 billion	$3.50 billion	$3.17 billion	$2.34 billion
Local Economies	No impact.	Impacts mainly from increased level of local mining activity. Impact would depend on a variety of factors, including the level of activity currently occurring, degree of community's specialization in mining, and community size.	Impacts mainly from decreased level of local mining activity. Impact would depend on a variety of factors, including the level of activity currently occurring, degree of community's specialization in mining, and community size.	Similar to Alternative 3, but many more communities are likely to be affected. Degree of impact would depend on a variety of factors, including the level of activity currently occurring, degree of community's specialization in mining, and community size. Communities in Nevada would see the greatest impact relative to other states.

Preferred Alternative

BLM's preferred alternative is Alternative 3, the Proposed Action. The preferred alternative may change in the final EIS. Portions of the other alternatives may be used to create a new preferred alternative in the final EIS in response to comments received on the draft regulations or draft EIS.

Chapter 3
Affected Environment & Environmental Consequences

Introduction

Chapter 3 describes the physical, biological, social, and economic environment and the potential effects on the human environment of the Proposed Action and other alternatives described in Chapter 2. This format eliminates the redundancy created when the affected environment and the environmental consequences are discussed in separate chapters. Chapter 3 is organized by resource, allowing the reader to better review and understand the existing situation and the potential environment impacts of all the alternatives by resource.

Except for BLM-administered lands that are under wilderness review, the proposed regulations apply to all operations authorized by the mining laws on public lands administered by BLM, including Stock Raising Homestead lands where the mineral interest is reserved to the United States. Mineral activity on BLM-administered lands under wilderness review are subject to the requirements at 43 CFR 3802. In addition, public lands open to mineral entry under the mining laws but not administered by BLM (national park, national forest, and national wildlife refuge lands) are not covered by the proposed regulations. Mineral disturbances on these lands are regulated by the relevant federal land managing agency, i.e. National Park Service, U.S. Forest Service and U.S. Fish and Wildlife Service.

Most public lands open to activities under the mining laws are in the 11 contiguous western states, plus Alaska. (See Table 3-1.) Within the study area, BLM administers a surface and mineral estate of about 260 million acres. In addition to this surface/mineral estate, BLM also administers 300 million more acres of mineral estate underlying other lands. The surface of 70 million acres of these mineral estate lands were patented under the Stock Raising Homestead Act. By statute these patents had the mineral estate retained by the Federal Government and kept the lands open to mineral entry under the mining laws.

The study area accounts for about half of the total acreage within the United States, but 99% of all public lands administered by BLM are within the 12-state study area. BLM-administered public land acreage as a percentage of the total acreage within each state within the study area ranges from less than 1% in Washington to more than 68% in Nevada. In addition, 95% of the lands patented under the Stock Raising Homestead Act, where the mineral estate was retained by the Federal Government, are also within the study area. Almost half of these split-estate lands are located in New Mexico and Wyoming.

Table 3-1. Distribution of BLM-Administered Public Land, Stock Raising Homestead Act Acreage, and Total State Acreage

States	Public Land Acreage[1]	SRHA Acreage	Total State Acreage
Western U.S.:			
Alaska	86,908,060	0	365,481,600
Arizona	14,220,457	2,985,746	72,699,000
California	14,556,074	3,423,222	100,206,720
Colorado	8,260,306	8,405,015	66,485,760
Idaho	11,775,052	3,563,294	52,933,120
Montana	6,259,211	7,720,173	93,271,040
Nevada	47,841,264	494,637	70,264,320
New Mexico	12,541,069	15,621,192	77,766,400
Oregon	16,145,615	3,375,688	61,598,720
Utah	22,832,630	2,800,709	52,696,960
Washington	370,110	513,746	42,693,760
Wyoming	18,373,492	18,172,713	62,343,040
Total Study Area	260,083,340	67,076,135	1,118,440,440
Other States:[2]	1,531,548	3,286,790	1,152,902,920
U.S. Total	261,614,888	70,362,925	2,271,343,360
Study Area as Percent of U.S.	99%	95%	49%

[1] Includes all public lands administered by BLM except for Land Utilization Project lands, to which the 3809 regulations do not apply. Also includes lands that are withdrawn from mineral entry.

[2] Includes Alabama, Arkansas, Florida, Illinois, Iowa, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, N. Dakota, Oklahoma, S. Dakota, and Wisconsin.

Source:Public Land Statistics 1996 (BLM 1997).

Public lands in the 12-state study area have a wide range of climates, landforms, vegetation types, and social and economic settings. Physical characteristics such as climate and soil types and biological parameters such as vegetation productivity and the presence of special status species differ markedly. The physical and biological attributes described in this chapter highlight these differences only where needed to describe the affected environment in relation to the regulatory alternatives.

The Proposed Action and alternatives analyzed in this chapter consist of potential changes in the regulations that are set forth to prevent unnecessary or undue degradation of public lands by operations authorized under the mining laws. Environmental consequences that would result from these potential regulatory changes can be categorized and presented in many ways. Some impacts are the direct effect of implementing the action, whereas others are more indirect, occurring later or further away. The impacts may last for only a short time or may affect the environment for a long period. The environmental consequences may be adverse, beneficial, or both. Many of the potential regulatory changes would be largely administrative and would have little direct effect on the environment. These administrative changes are aimed at improving agency efficiency and effectiveness, increasing consistency, or meeting other nonenvironmental objectives or public policies.

The administrative changes would, however, result in indirect or secondary effects on physical, biological, social, or economic aspects of the environment. Chapter 3 discusses all aspects of the environmental consequences of the Proposed Action and other alternatives. But the environmental impacts of future on-the-ground disturbances, requiring National

Environmental Policy Act compliance, will be analyzed on a case-by-case basis.

As this EIS was prepared to evaluate the environmental consequences of regulation alternatives, it was not practical to document the affected environment or environmental consequences at the level of detail generally found in site-specific EISs. The regulatory alternatives will affect the nature, extent, and environmental consequences of future mineral activity on public lands administered by BLM. The uncertainties of where, when, and how this future mining will occur make accurate long-term forecasts impossible and even short-term projections tenuous. However, to aid in the analysis, reasonably foreseeable assumptions on future activity were prepared (Appendix E). These assumptions became the basis for much of the environmental consequences discussed in this chapter. The approach used to document the reasonably foreseeable significant effects conforms to the requirements at 40 CFR 1502.22 when dealing with situations where information is incomplete or unavailable. Approval of future mineral activity, subject to National Environmental Policy Act, will be documented and analyzed at a level of detail commensurate with the proposed on-the-ground disturbance.

Cumulative Effects

The regulations for implementing the National Environmental Policy Act require federal agencies to analyze and disclose *cumulative* effects—effects that result from the incremental impact of an action "when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR 1508.7)

The Proposed Action and alternatives involve changes in the regulations and as such are broad in scope. As a result, this EIS is programmatic, addressing environmental consequences that are correspondingly broad in scope. Furthermore, neither the Proposed Action nor the alternatives would be implemented in a vacuum. Implementation would be interwoven with many other actions, events, and trends taking place at local, regional, national, and international levels. For example, actions on federally administered lands may have beneficial or harmful impacts to systems on private lands. The analysis in this chapter strives to consider these changes.

For example, mineral activity is not the only factor that affects the public lands. Climate, recreation, livestock grazing and wildlife use, management practices on adjoining lands, and the introduction and spread of alien weeds are also key considerations. The future of the public lands cannot be predicted by considering changes in mineral activity and the 3809 regulations alone. Similarly, BLM regulations, management practices, and policies are not the only factors that affect the mining industry and western rural communities. Of major importance are currently undiscovered mineral deposits; local, national, and international supply and demand for mineral commodities; regional population growth; changing demographics, lifestyles, and values; economic competition and restructuring; and changing laws, policies, and practices being implemented by other federal and state agencies.

Population growth and demographic changes in the West and in many western rural communities will continue to transform rural economies. Population growth in many rural communities, while contributing to economic growth and diversification, will continue to diminish the relative importance of mining in those communities. Communities that continue to lose population and whose economies are in decline may be further strained by any decrease in mineral activity. Demographic and land use changes might increase or decrease a community's tax base. Where economies are stable or growing, the tax base would likely be stable. Where populations continue to decline or mineral production significantly declines, the state and local tax revenues might decline.

The protection and recovery of federally listed species and their habitats—for example, desert tortoises in the desert Southwest—are also likely to change the way mining activity is conducted on federal lands. Future activities designed to avert habitat loss and endangered species listings will be implemented under any of the regulatory alternatives considered in this EIS.

A fundamental assumption of this analysis is that, with or without changes to the 3809 regulations, the human environment within the study area will continue to change. The 3809 regulations are but one small factor in defining the future conditions of the human environment. The potential environmental consequences of the proposed action and alternatives, including the cumulative effects, are documented by resource in this chapter.

Irreversible and Irretrievable Commitment of Resources

A resource is irreversibly committed when an action alters the resource so that it cannot be restored or returned to its original or predisturbance condition. A resource is irretrievably committed when a resource is removed or consumed.

For example, in the extraction of gold, the mining of waste rock and ore would be an irreversible commitment of resources. Although the gold in ore would be irreversibly committed from geologic formations, the precious metal would be retrieved and placed in long-term economic circulation.

Another example of irreversible losses involves soil erosion. Soil losses from handling, erosion losses from topsoil stockpiles, and other unavoidable erosion losses would be irreversible. The net evaporative losses of water from a pit lake would be an example of a long-term irretrievable commitment of resources. Consumptive use of process water would be an example of a temporary irretrievable commitment of resources, occurring only during mining.

The level of future mineral activity under the proposed action or alternatives would directly affect the magnitude of the irreversible and irretrievable commitment of resources. But provisions of the alternatives would also define the nature and extent of these commitments. These types of irreversible and irretrievable effects are discussed as part of the environmental consequences of the alternatives for each resource in this chapter.

Environmental Justice

Federal agencies are required to address "disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations" (Executive Order 12898). During this analysis BLM considered all public input from persons or groups, regardless of age, race, income status, or other social and economic characteristics. A review of the document does not reveal any disproportionately high and adverse effects or issues specific to minority or low-income populations.

This document is a broad assessment of proposed regulations. More environmental assessment, on a site-specific basis, would be completed before any activities occur on the ground.

Mineral Resource Development

Affected Environment

Geology

The public lands have a rich geologic history and an abundance of mineral resources. The geology on public lands is highly complex and difficult to summarize. The regions have been subdivided into geologic physiographic provinces such as the Basin and Range, Colorado Plateau, Snake River Plain, Rocky

Mountain, and the Columbia Plateau, to name a few. The public lands includes geologic formations dating from the Archean to Quaternary.

Gold is extensively produced in Nevada, copper in Arizona, placer gold in Alaska, and gypsum in California. Minerals extracted from the public land include copper, gold, silver, lead, mercury, uranium, perlite, and limestone. The potential for continued mineral production on public lands is high, and the mineral industry continues to develop these lands for a variety of mineral products.

Development of Mineral Properties

To understand how the 3809 regulations apply to mineral activities on public lands, it helps to review the steps or phases used to locate and develop mineral properties. The following is a description of the process used by the mining industry to develop a mineral property and the types of mining methods used to extract minerals.

All mining operations begin with exploration activities that require large dollar investments coupled with a high risk of failure. Success of mining depends heavily on the success of exploration. Exploration may discover a mineral occurrence and may even outline its size and mineral character. The ore deposit is "found" or "developed" only through the combined efforts of the many geologists, geophysicists, geochemists, metallurgists, mining engineers, lawyers, and managers who believe that a mine can be profitably developed. Deposits go through many cycles of evaluation and rejection. Geologic understanding improves and worldwide economic and political conditions change before deposits are brought into production. The location of a mining claim or group of claims follows the prospecting or exploration program and is essential to the next phase of developing a mineral deposit into a mine.

The development of a mine from grassroots exploration to production can be roughly divided into three stages. Each stage requires applying more discriminating (and expensive) techniques over a successively smaller area to find, develop, and produce an economic mineral deposit. These stages can be grouped into the following activity categories: reconnaissance, exploration/ prospecting, and mine development.

The lag time between the first discovery of a mineral occurrence and the opening of a mine may be 10 years or more. Some gold properties are opened within 3 years, whereas copper deposits may require more than 10 years. During this time all available and reasonable geologic information is analyzed, engineering decisions are made for the design of the mine, equipment and workers are acquired, mine closure and reclamation plans are prepared, and the financial capital is obtained.

Reconnaissance. The first phase of exploration involves researching the geologic literature; reviewing the geologic models for the minerals of interest; and interviewing local, knowledgeable, experienced people and companies working in the area of interest. Once reconnaissance has found a favorable area, usually occupying tens of square miles, airborne and satellite remote sensing surveys and limited ground surveys may be used to examine the general characteristics of the area's geology and mineralization. Smaller targets of interest are then selected for more detailed study. Such study may involve detailed surface geologic mapping, geophysical surveying, and geochemical sampling programs, none of which disturb the land's surface. Academic and government entities or major corporations usually perform these studies.

Reconnaissance-level mineral inventories normally cause no more surface disturbance than an occasional sampling of soil, rocks, or stream sediment. Minor off-road vehicle use may be required. To protect its interests, the company will begin staking and recording mining claims. These actions do not disturb the surface or require surface reclamation and would be considered casual use.

Prospecting and Exploration. In the United States the terms prospecting and exploration are generally used interchangeably. Prospecting normally denotes activities of a single person, whereas exploration is carried out by a company using a variety of techniques to evaluate both the surface and subsurface geologic characteristics of a mineral occurrence (Hartman 1992).

When a sufficiently anomalous mineral occurrence or favorable occurrence indicator is found, a mineral prospect is established and is subjected to more intense evaluation through exploration. This area may range from a single square mile to an entire mountain range of several hundred square miles.

Mineral exploration has had many cyclic developments in the last half century. Early efforts concentrated on comparing new areas with existing mines and mineralization. With the introduction of airborne and satellite remote sensing, computer models, and a better understanding of geologic processes, porphyry copper deposits, Mississippi Valley lead-zinc, and volcanogenic massive sulfide deposits were found. In the past 15 years disseminated gold and stratiform precious metal deposits have been the main targets for exploration. In the future major exploration targets will focus on (1) world-class deposits of all kinds of minerals, (2) small high-grade deposits with low capital costs that will be profitable under any market condition, and (3) polymetallic deposits that can be mined by surface methods (Hartman 1992).

Efforts to locate a mineral prospect include detailed mapping, sampling, and geochemical and geophysical study programs. At this time the mining company usually begins to acquire property, and most mining claims are located to secure ground while trying to make a mineral discovery. Surface-disturbing activities in prospecting involve more intense soil and rock chip sampling using mostly hand tools, frequent off-road vehicle use, and the placing and maintaining of mining claim monuments. This activity is normally considered "casual use" (43 CFR 3809.1-2) and does not require BLM notification or approval. Operations under casual use require no mechanized equipment or explosives but must reclaim disturbed areas.

Exploration involves prospecting at a more intense level and in a smaller area. In addition, roads are built, trenches dug, and exploration holes drilled. In later stages of exploration an exploratory adit or shaft may be driven. If the prospect already has underground workings, these may be sampled, drilled, or extended. Subsurface exploration by shafts and large-diameter (more than 18 inches) drill holes are normally used for finding mineral targets or the development phase of mining and not initial exploration.

Exploration may involve mechanized earth moving equipment and drill rigs and explosives. A typical exploration project requires building about 5,000 feet of access road, setting up a dozen drill sites with each site having several holes drilled to less than 500 feet, and possibly digging several trenches 200 feet long by 8 feet wide by 6 to 8 feet deep. The number of pits and trenches depends on the expected size of the mineralized area as determined by surface mapping and sampling. Test pits are usually less than 20 feet deep and 10 feet in diameter. Trenches are normally less than 10 feet wide, 20 feet deep, and 100 feet long. The area for a drill rig is about 50 feet square. Most surface disturbed for exploration amounts to less than 5 acres. Exploration is normally conducted under a Notice in the existing 3809 regulations, which require the operator to notify BLM 15 days before beginning activity. If exploration is conducted in sensitive areas or exceeds the 5-acre threshold, an approved Plan of Operations is required.

Mine Development. If exploration results show that an economically viable mineral deposit is present, on-the-ground activity will intensify to obtain detailed knowledge on reserves, possible mining methods, and mineral processing requirements. This effort will involve more intensely applying all the previously used exploration tools. Once enough information is acquired, the operator will conduct a feasibility study to decide whether to proceed with mine development and what mining and ore processing methods to use.

When an operator decides to develop a property, the mine permitting process begins. Once BLM approves the Plan of Operations, work begins on developing the mine infrastructure: building the mill, offices, and laboratory; driving development workings for an underground mine or prestripping for an open pit mine; building access roads or haulage routes; and placing utility services. During this development, exploration that could define other areas to be mined continues.

Mine development involves the following activities: mining, ore processing, tailings disposal, waste rock placement, solution processing, and metal refining. Such activities require the use of heavy earth moving equipment, explosives for mining, materials handling, exploration equipment for refining the ore reserve base, hazardous or dangerous reagents for processing requirements, and general construction.

Once enough facilities are in place, mine production begins. Often concurrent with production are "satellite" exploration efforts to expand the mine's reserve base and extend the project life. Upon completion of or concurrent with mining the property is reclaimed.

The sizes of mines vary greatly. Not all mines require all the previously mentioned facilities and equipment. Acreages involved can range from several single acres to several hundred acres. Most projects disturb more than 5 acres and require an approved Plan of Operations.

Mining Methods

The impact of mining and the effects of regulations on the mining industry depend on the mining methods that can be used and on the mineral deposits to be mined. Mining methods have been classified to help select extraction methods for deposit types and for other factors. In addition, this classification helps evaluate the impacts of the chosen method. Mineral deposits have been geometrically described by an idealized shape, inclination, size, and depth. Complex or composite bodies consist of more than a single deposit type (Hartman 1992).

The ideal shapes are either tabular or massive with narrow bodies or pipes being subordinate. Tabular bodies of minerals usually extend hundreds of feet horizontally and only a few tens of feet vertically. Ore from tabular bodies is generally extracted by strip mining, of which placer mining is a subcategory. Massive ore bodies are approximately equip-dimensional (laid out for easy equipment use) and are usually a few hundred feet in each dimension. Ore from massive bodies is generally extracted by open pit mining (Hartman 1992).

In surface mining the horizontal angle of the deposit (usually a bedded deposit with overburden less than 100 feet thick) and the deposit's relative width determine whether the minerals are mined by strip or pit methods. For example, flat-lying deposits are opened up by making narrow mining cuts into the deposit and then casting or hauling the next cut's waste into the previously mined area. Placer mining methods are used for deposits that are under water or have a large amount of ground water because of the need to handle large amounts of water. For deposits lying at a steeper angle or with thick overburden, open pit methods are used. The stability of the unmined rock determines the pit's depth.

Strip Mining. Strip mines have the following characteristics.

- Usually designed for tabular deposits that are rectangular and longer than they are wide.
- Found in areas of rugged topography where the deposit may be bisected by narrow gullies.
- Located where the overburden is relatively shallow (low stripping ratios) and the deposit itself is not at a great depth below the land surface.
- Used where the deposit is interbedded between uneconomic rock units or located in topographic low areas (valleys).

In strip mining the topsoil and overburden are removed from the ore deposit and stockpiled separately, usually a short distance from the initial mine cut. The deposit is mined in a linear fashion until the end of the ore deposit or the property limits are reached. A second identical pass is then made next to the first except that the overburden is placed into the previous mined out area. After the third cut is made, the original stockpiled overburden is graded into and over the first two cuts. Topsoil is then respread over the site, and vegetation is reestablished. The remaining deposit is mined in a similar fashion until the deposit is exhausted. The strip mine is reclaimed at the same time that ore is mined, except for the last one or two mine cuts, which are reclaimed after the mine is closed.

In strip mining little more area is disturbed for waste rock or tailings dumps because these materials are returned to the mined area as soon as there is space. Access roads, mill and office buildings, and water treatment facilities usually occupy the only other areas needed for this type of mining.

Placer Mining. Suction or mechanical dredge mining techniques are commonly employed to extract minerals lying in loosely consolidated deposits with large amounts of ground water or in rivers or lakes. Intake nozzles for suction dredges vary from 2 to 10 inches in diameter. The most common sizes range from 4 to 6 inches. Generally the processing system is relatively simple with a grizzly (screen) separating off the oversized rocks. Screens classify the smaller material and a sluice box, with regular or modified iron angle-iron riffles, concentrates the valuable minerals. The recovery system is usually supported on floats above the intake nozzle in the pond that is created when excavating the overburden. A gasoline powered high-pressure water pump supplies water to the intake for suction to extract the mineral-bearing material from the pay streaks or bedrock areas.

In the past, mechanical bucket-line dredges were used to mine deeply buried placer minerals. These dredges moved great amounts of material while floating in a pond created by the excavation of the barren gravels. Material was excavated and processed on and tailings were disposed from the floating platform. The moving chain of buckets excavated the gravel. Gravels were emptied into revolving screen classifiers, which separated the undersized material from the oversized. The oversized material was transported by conveyors behind and away from the dredge.

The processing plant for the recovery of the gold consisted of either jigs or sluice boxes onboard the dredge. Most of these dredges are no longer operating on public lands. Smaller cutter-head dredges can be used. But because of high mechanical wear and many breakdowns, other mining methods are more commonly used to mine alluvial deposits.

Placer deposits are mined either by strip or pit methods with the addition of water control structures such as bypasses or drains to dewater the gravel deposits. Once the water has either been removed or reduced to an amount manageable through the use of pumps, the topsoil is removed and saved for future respreading over the mined areas. The overburden is removed and stockpiled or placed in previously excavated areas as part of the reclamation sequence of the mine. The mineral-bearing gravels are hauled to the processing or washplant, where gravity separation methods are used to recover valuable minerals in the sluice box or jig unit. The washed gravels are placed in the previously mined areas, usually on top or intermixed with the overburden. The tailings are then reshaped, covered with the original topsoil, and reseeded to prevent erosion and finish the reclamation of the mined site.

Open Pit Mining. Open pit mines have the following characteristics.

- Usually designed for massive or steeply inclined (dipping) deposits.
- Dimensional or narrow in extent and size.
- Found in areas of rugged topography.
- Located where the overburden is relatively thick (high stripping ratios).
- Located where the deposit is relatively deep below the land surface.
- Used where the deposit is interbedded between uneconomic rock units or where the rock strength is weak and not suitable for underground methods.

The topsoil and overburden are removed from the ore deposit, and the deposit is mined in a downward fashion until the limits of the deposit are reached. The limits of the mine pit are not solely related to the grade of the ore but also to the engineering of the pit slopes and the economics of removing overburden and ore from the pit.

The stockpiled overburden is placed in valleys near the mine site or on the surface of adjacent land and then graded into a stable shape. The waste rock from the mill is placed in large settling ponds or may be placed on the surface of the land and reshaped. Ponds are placed where they are most cost effective and the topography is most stable. The land beneath the ponds and waste piles is permanently lost to any other uses. Topsoil is placed over the overburden or waste piles and the pond areas when they are reclaimed, and vegetation is established at the sites.

Reclamation is generally not concurrent with mining and is not usually begun until the mine is closed. If the mine is deep, the cut is generally not filled. In open pit mining other areas are disturbed for waste rock and tailings dumps, access roads, mill and office buildings, and water treatment facilities.

Underground Mining. Underground mining generally involves the removal of the mineralized vein or lode from the surrounding country rock. Minable widths vary from less than 4 feet to more than 20 feet. Ore is usually extracted from highly competent rock or rock that is reinforced with bolts or anchors so that surface subsidence is negligible. Massive block caving techniques may create localized subsidence of the surface. The mined-out underground workings are usually backfilled with the waste rock from mining or the mill tailings. Backfilling maintains the competency of the surrounding rock and prevents subsidence.

In all underground mining some of the waste must be placed on the surface temporarily or until there are enough underground openings to hold the replaced waste rock. Some waste rock may be placed on the surface permanently because there is not enough room to replace the waste or the mining method is not amenable to replacing the waste.

Most surface impacts from underground mining involve mining-related surface uses such as milling, office functions, storage, waste and tailings disposal, and water treatment. All of these activities are similar if not the same as the surface-disturbing activities of surface mines and mill sites.

In Situ Mining. A mining method that is considered neither surface nor underground is "in situ" extraction of valuable minerals by remobilizing or leaching minerals where they occur. This method drills holes on a grid pattern into the ore deposit. A dissolving or leaching solution is injected through these holes into the ore deposit, where the chemicals extract the desired minerals. The pregnant liquid is then removed from a different well or series of wells and piped to a recovery plant or mill. There the minerals are recovered and the barren solution returned to the injection wells and the cycle begins again. In situ mining appears to be more like a milling operation and less like most extraction methods. Except for the access roads and pipelines leading to the recovery facility, the surface is only slightly disturbed.

Mill Sites and Tailings Sites. Mill and tailings sites are usually associated with one of the other types of mining methods, depending on the characteristics of the ore. At mills, minerals can be extracted either by chemical or physical methods. Mill sites can also be established apart from any specific mine and operate as a small custom mill for small operators.

Storage facilities and mills for processing mined rock and treating tailings have traditionally been placed on areas that have no mineral value. These sites may be next to the mine or removed some distance from the mine site.

Mill sites are used for locating offices, warehouses, repair shops, crushing and grinding systems, chemical and physical separation and concentration systems, leach pads, and other facilities that support the mine. Mill processing plants may be as simple as a sluice box next to a water source and the alluvial material trucked to the site. Or they may consist of a group of structures, each housing a part of the processing machinery that recovers the commodities in a series of steps. Milling of certain ores ranges from simple gravity and water washing systems to chemical and flotation treatments to mechanical crushing and sorting processes that form the finished product. Mill facilities may cover an area from less than 1 acre to 10 or more acres.

Since the 1980s tailings impoundments have become a small part of the mill site operations, as more mines used cyanide heap leaching techniques to recover the minerals and only small treatment and concentration buildings are needed for mills. Some heap leach pads are massive—2,000 feet wide by 2 miles long—and are in continuous use for up to 5 years.

Tailings disposal is a major if not sole purpose of some mill site claims. Tailings is the general term for all waste rock and processed rock that remains on the surface after the valuable minerals have been extracted. Some waste rock is barren of mineralization and may cause no problems being left on the surface after reshaping and the establishing of vegetation cover. But other waste rock has minerals with the potential to generate acid or alkaline leachate and may affect the environment for many years.

Tailings have undergone physical and in some cases chemical changes and may have been ground so fine that they are more susceptible to erosion or chemical changes than in their original state. Or residual traces of treatment chemicals may be trapped in the rock. In general, tailings and waste areas occupy about 10% of the total area disturbed by mining.

Mill sites may require either a Notice or a Plan of Operations, depending on whether they are in designated special status areas or if they exceed 5 acres.

Past Activity Under the 43 CFR 3809 Regulations

The 3809 regulations were established in 1981. The following information on past mining on the public lands was developed from public land records and internal BLM surveys.

Between 1981 and 1997 a total of 20,700 Notices and 3,400 Plans of Operations were submitted to BLM. An average of 1200 Notices and 200 Plans of Operations have been submitted each year. As of 1997, a total of 6,216 Notices and 932 Plans of Operations were considered active (see Tables 3-2 and 3-3), meaning that operations under the Notice or Plan were still ongoing. The remainder had been reclaimed and BLM had determined that they were closed.

Table 3-2. Notice-Level Activity

Type of Activity	Submitted Since 1981		Closed Since 1981		Currently Active	
	# Notices	Acres	# Notices	Acres	# Notices	Acres
Exploration	13,653	27,463	9,767	18,433	3,915	9,555
Strip Mining	257	738	155	460	102	278
Open Pit	999	2,071	453	1,022	556	1,048
Placer	5,012	12,133	3,382	8,670	1,317	3,472
Independent Mill Site	135	402	65	193	66	200
Underground	644	1,101	386	678	260	436
Total	20,700	43,908	14,208	12,866	6,216	14,989

Table 3-3. Plan-Level A ty						
Type of Activity	**mitted Since 1981**		**Closed Since 1981**		**Currently Active**	
	Plans	**Acres**	**# Plans**	**Acres**	**# Plans**	**Acres**
Exploration	1,302	18,742	1,032	5,415	269	13,422
Strip Mining	87	13,123	66	8,332	22	4,790
Open Pit	591	117,166	261	14,563	330	101,564
Placer	1,288	7,993	949	6,269	232	1,724
Independent Mill Site	52	6,281	18	104	33	6,182
Underground	85	6,514	39	399	46	6,115
Total	3,405	169,819	2,365	35,082	932	133,797

Tables 3-4 and 3-5 show the distribution of current mineral activity by state and the types of activity currently occurring on public lands in the study area.

Table 3-4. Percentage Distribution of 1997 Notices and Plans by Type of Activity		
Type of Activity	**Notices**	**Plans**
Exploration	63	29
Strip Mining	2	2
Open Pit	9	35
Placer	21	25
Independent Mill Site	4	4
Underground	1	5
Total	100%	100%

Table 3-5. Total 1997 Plans and Notices in Study Area				
State	**Total Notices**	**% of Total Notices**	**Total Plans**	**% of Total Plans**
Alaska	153	2	47	5
Arizona	909	15	96	10
California	1,009	16	290	31
Colorado	264	4	23	2
Idaho	135	2	35	4
Montana	300	5	27	3
Nevada	2408	39	277	30
New Mexico	68	1	6	1
Oregon/WA	386	6	38	4
Utah	410	7	39	4
Wyoming	174	3	54	6
Total	6,216	100	932	100

The surface disturbance varies for each type of operation from an average of 300 acres of disturbance for an average open pit mine to 7.4 acres for placer mines. Notices-level operations range from 0.5 to 4 acres disturbed for exploration. Tables 3-2 and 3-3 show the average number of acres disturbed by Notice- and Plan-level operations.

Table 3-6 shows the number of notices of noncompliance that have been issued on public lands and the reasons they were issued.

Table 3-6. Notices of Noncompliance

Type of Activity	Notices		Plans	
	# Issued Since 1981	# Currently Outstanding	# Issued Since 1981	# Currently Outstanding
Exploration	384	138	79	14
Strip Mining	7	0	4	2
Open Pit	88	9	66	10
Placer	145	24	70	9
Independent Mill Site	26	6	26	8
Underground	40	4	13	3
TOTAL	690	181	258	46

Currently Outstanding Notices of Noncompliance

Reason for Issuance	Notices	Plans
Failure to File a Notice or Plan	13%	19%
Issued During Operational Phase of Project	15%	35%
Failure to Reclaim	72%	46%
Total	100%	100%

The existing regulations have three levels or procedures that need to be followed for incidents of noncompliance. The first level or procedure is the issuing of a notice of noncompliance requiring the operator to correct the problem by a certain time. If the operator does not correct the noncompliance, a record of noncompliance is issued, and the operator is required to post bond for the entire operation at 100% of reclamation costs. If the operator takes no further action, the operator's case is sent to the U.S. Attorney's Office to be resolved. Of the total incidents of noncompliance 76% have been resolved by notices of noncompliance, 15% by records of noncompliance, and 9% by the U.S. Attorney.

Of the 254 active notices of noncompliance, 208 are for Notice-level operations, and 46 are for Plan-level operations. Of all public land mining operations, 3% of the Notice-level operations and 4% of the Plan-level operations have been issued notices of noncompliance. Seventy-three percent of all notices of noncompliance issued have been resolved.

Environmental Consequences

Impacts Common to All Alternatives

Under all alternatives compliance with environmental regulations represents a cost to the mining industry and affects the level of mineral exploration and mining. Included are costs of delays resulting from longer processing times, direct costs of conducting environmental studies, or costs of having to use certain technology. Delays could result from an operation's not being able to mobilize on schedule because of weather and other restrictions. Delays could mean that a deposit would not be developed, production would not begin on schedule, and that the operation would lose revenue. Environmental standards also increase the cost of doing business.

Alternative 1: No Action

Administration of Surface Management Regulations. Under No Action the mining industry would continue to operate under the existing regulations, and the industry would continue to assimilate the cost of the regulations. Operations would continue to be processed, and compliance would be completed.

Casual Use. Casual use should only negligibly disturb the environment. But major problems arise when groups get together to recreate, explore for minerals, or placer mine for gold. Under these situations the cumulative impacts could exceed negligible levels, resources would be damaged, and the disturbance would generally not be reclaimed.

Notices. The existing regulations for Notices would require BLM to process actions in a short time period and allow the operator to continue operations without delay. The Notice would be reviewed by an interdisciplinary team, but the review would be limited to 15 days. In some situations the review specialist could not review the document, and the project would proceed without this specialist's input. Under these conditions resource damage could result.

Under the existing regulations, if the area occupied by an operation increases by no more than 5 acres a year, the operation could remain a Notice-level mine and bypass the Plan of Operations process. Some operations could become fully operational mines exceeding 200 acres, be regulated only by a Notice, and still not have to undergo environmental review.

A Notice could be used to operate in an environmentally sensitive area since the existing regulations list only a few areas that are environmentally sensitive and thus require a Plan of Operations. Any operations that are in sensitive areas and do not require a Plan would increase the potential for degradation without the intense review of a Plan of Operations.

Notice provisions could be difficult to enforce because no reclamation bond is required for Notice-level activity. The lack of a bond and enforcement process could result in areas not being reclaimed when operators leave, although this is not a common practice. BLM issued about 500 notices of noncompliance (out of about 29,400 Notices filed since 1981) for failure to reclaim, representing 2% of all Notices submitted. BLM field offices would continue to differ in their processing of Notices.

Plans of Operations. Under No Action, Plans of Operations would continue to be reviewed in detail by BLM and would undergo environmental review under the National Environmental Policy Act (NEPA). NEPA's analysis would allow for a more detailed review of the operation and ensure against unnecessary or undue degradation.

Reclamation bonding would be required by policy for all chemical processing areas, but only a portion of the reclamation cost would be bonded for other facilities. BLM field offices might not uniformly implement bonds and other performance measures that BLM has developed by policy and experience. Performance measures could be difficult to use, depending on how well the operator could implement them.

Inspection and Enforcement. The existing regulations make timely resolution of noncompliance difficult. They also do not outline the needs for consistent review of operations. As a result, operations might not be inspected in a timely manner, and resource degradation could result.

Under the current process if an operation is in noncompliance, BLM would need more time for coordination with the operator and other organizations to resolve the noncompliance. If the operation does not conform to the Plan or Notice, BLM would issue a notice of noncompliance and request compliance within a certain time. If the operator still does not comply, the operation's file would be sent to the BLM state office for transmittal to the U.S. Attorney's Office. Because of the U.S. Attorney's workload and priorities, years could pass before the case could be settled and the environmental problem corrected.

If the operation is abandoned and the case is not settled in the courts, there might be no bond to reclaim the operation and resolve all environmental concerns. The site would either not be reclaimed, or public monies would be used to reclaim it.

Data from the recent past suggests that within the next 20 years 1100 notices of noncompliance would be issued for Notice-level activity, and 200 notices of noncompliance would be issued for Plan-level activity, assuming that the current rate of noncompliance persists.

Administration Practices. Under the existing regulations, mines proposed either for areas withdrawn from mineral entry or for extracting suspected common variety minerals under the Mineral Materials Act of 1947 and the 1955 Surface Resources Act would be processed under a Notice or a Plan of Operations. The operator would not have to demonstrate a valid claim before disturbing the surface. Potential environmental impacts could result, and the Federal Government could lose revenue.

Mineral Development. The overall number of Notices and Plans of Operations submitted under No Action is expected to remain about the same or decrease slightly. Individual states might vary from the general trend in the number of Notices and Plans submitted. An estimated 1,200 Notices and 200 Plans of Operations would be submitted each year. Over a 20-year period 24,000 Notices and 4,000 Plans of Operations would be submitted.

Table 3-7 shows the acreage that would be disturbed per operation and total acres that would be disturbed in 20 years under No Action.

Table 3-8 shows the possible number of operations at the Notice and Plan levels by operation type during the next 20 years

Table 3-7. Acres Disturbed under Alternative 1

	Acres Disturbed		
	Per Operation	Per Year	In 20 Years
Notice Level	2 acres	2,400	48,000
Plan Level	50 acres	10,000	200,000

Table 3-8. Notice- and Plan-Level Operations over a 20-Year Period under Alternative 1

Type of Operation	Notices	Plans
Exploration	17,000	1,200
Placer	300	100
Strip	1,300	800
Open Pit	6,000	1,450
Underground	780	90
Mill Site	170	80
Total	25,550	3,720

Alternative 2: State Management

Administration of Surface Management Regulations. Mining regulations in the states are relatively new and still evolving. The main regulatory provisions in most cases are less than 8 years old, and many are newer (McElfish and others 1996). State programs are either reclamation or water pollution based. (See Appendix D.)

Casual Use. Under the State Management Alternative proposed mineral activities that would be classified as casual use would not be reviewed by any state government. Depending on the state requirements and their minimum surface disturbance criteria, the mineral activity might not be reviewed. States would not require casual use operations to complete reclamation, and public lands could undergo undue and unnecessary degradation. BLM could not prevent any of the degradation except through negotiations with state organizations.

Notices. For Notice-level operations, depending on state requirements, operators would not be required to submit any documentation for review by a state organization. In some states, operations smaller than 5 acres would not be reclaimed. Operations would be required to meet performance standards like the ones that they currently meet for operations smaller than 5 acres.

Plans of Operations. Under State Management, depending on state criteria for surface disturbance or production, operations would be required to submit some form of a Plan of Operations to a state regulatory agency. The operation would have to meet performance standards and requirements that would depend on the state in which it is operating. Western states have environmental regulations that require some of the reviews outlined in BLM's existing regulations. Some states would require environmental reviews. Others would not. Operations would have to comply with water regulations and standards and monitoring outlined by the states. Bonding would also be required.

Inspection and Enforcement. Operations would have to undergo compliance inspections, but depending on the state organizations, standards or schedules might not be established. BLM would issue no notices of noncompliance under this alternative and would not be involved in enforcement. States would enforce their own programs. (See Appendix D.)

Mineral Development. A 5% or less increase in exploration and mining is projected for the State Management Alternative. (See Appendix E.) These changes, by activity type, are shown in Table 3-9.

Table 3-9. Changes in Mineral Activity under Alternative 2

Recreational Mining	Small Exploration	Large Exploration	Small Placer	Large Placer	Small Open Pit	Large Open Pit	Small Underground	Large Underground	Industrial Minerals
0%	+5%	<+5%	+5%	<+5%	+5%	+5%	+5%	<+5%	+5%

Table 3-10. Number of Operations under Alternative 2 over a 20-Year Period

Type of Operation	<5 Acres	>5 Acres
Exploration	17,800	1,300
Placer	6,300	1,500
Strip	320	110
Open Pit	1,400	840
Underground	820	95
Mill Site	175	85
Total	26,815	3,930

Table 3-10 outlines the possible number of operations by type under the State Management Alternative for the next 20 years.

Under these assumptions, 1300 operations would disturb less than 5 acres a year, and 210 operations would disturb more than 5 acres a year. Over a 20-year period 26,000 operations would disturb less than 5 acres each, and 8,000 operations would disturb more than 5 acres each.

Table 3-11 shows estimated acreage that would be disturbed under Alternative 2.

Table 3-11. Acres Disturbed under Alternative 2

	Acres Disturbed		
	Per Operation	Per Year	In 20 Years
Notice Level	2	2,600	52,000
Plan Level	50	10,500	210,000

Alternative 3: Proposed Action

Administration of Surface Management Regulations. The proposed regulations would result in increased cost to the mining industry.

Casual Use. Casual use would continue to be negligible. Groups or people would continue to engage in recreational mining, but under the Proposed Action BLM could designate casual use levels that require a Notice or Plan of Operations to decrease the cumulative impacts. This designation would allow BLM to ensure no undue or unnecessary degradation of public lands in areas of potential cumulative impact concern.

Notices. The proposed regulations contain two options for determining if an operation needs a Notice or a Plan of Operations. Under Option 1 a Notice would be required as under the existing regulations with less than 5 acres of disturbance. But Plans of Operations would be required for mines using leaching and other chemicals, mines in national monuments, and mines in areas designated as sensitive by land use plans. Under Option 2—the method currently used by the Forest Service—a Plan of Operations would be required if BLM determines from the submitted Notice that an operation would have significant impacts. If no significant impacts are expected, a Notice could be submitted.

Option 1 would keep the 5-acre threshold but allow for no more than five unreclaimed acres at a time. Acreage would count as unreclaimed until reclamation is completed, including the establishing of necessary vegetation. This requirement would be more environmentally protective than current practices. Option 1 would also designate other criteria for determining when a Plan of Operations would be required. These criteria include areas designated sensitive by a land use plan. This criterion would give BLM more flexibility to protect resources through land use planning. Through the same process it would allow the public to help determine sensitive areas.

The Forest Service option (Option 2) would give BLM wider latitude to determine if a Plan of Operations is required. This determination would be based on BLM's understanding of the possible impacts of the proposed operation. Option 2 could lead to either more or fewer Notices being submitted, depending on what impacts BLM would perceive. Operators would not necessarily know if a Plan or a Notice would be required until they have submitted a Notice or talked to BLM. This requirement could delay the operation and make it difficult for the operator to schedule its yearly operations.

Under a Notice the operator would be subject to performance standards that would minimize impacts to ensure that no undue or unnecessary surface degradation occurs. These standards would require the operator to design activities and take more time in developing operations.

The Proposed Action would require bonding for Notice-level operations. Reviewing and accepting a bond would require more work for BLM but would provide a way to enforce reclamation and mitigation. Public review of the reclamation calculations would delay the operation and increase BLM's workload in public review and comment.

Plans of Operations. The environmental performance standards of the Proposed Action are similar to current BLM polices and guidelines in various states. BLM has developed policies on certain issues, such as the cyanide management, through experience in working with the mining industry and the public. BLM has also applied its understanding of what actions or data are needed to prevent undue or unnecessary degradation. The Proposed Action has incorporated these policy standards into the regulations, and no other impacts to industry or natural resources are expected from these standards other than greater consistency among BLM offices.

Under Plans of Operations the Proposed Action would require bonding for 100% of reclamation. Bonding would increase workloads by requiring BLM to review in more detail the reclamation plan. But bonding would allow for a complete interdisciplinary review of the reclamation plan and the complete reclamation of disturbed land if the company defaults. The bond calculations would require a 30-day public notice and review, and BLM would have to coordinate the publication, review, and response to the public. Mining companies would face more delays in starting or modifying their projects.

Inspection and Enforcement. Under the Proposed Action in certain circumstances BLM could allow private citizens to accompany inspectors during mine inspections to view operations and determine if the mine is complying with the regulations. BLM would have to coordinate with local interest groups on inspection dates and ensure that private citizens understand all issues of mine safety. Private citizens would also have to meet the requirements of Mine Safety and Health Act. BLM's workload would potentially increase with public concerns unrelated to actual mining or environmental impacts.

The Proposed Action would require a mandatory number of inspections for certain types of operations. The specific inspection frequency is already included in BLM policies and is not expected to increase BLM workloads. Coordinating with private citizens during the inspection could decrease flexibility in the compliance inspection schedule.

Enforcement provisions of the Proposed Action would include the use of suspension orders and discretionary penalties, which BLM could assign for noncompliance. These orders and penalties would slightly increase the workload to develop the case and defend the orders and penalties. But BLM would have more legal recourse to be used against operators who refuse to comply.

Under the Proposed Action during a 20-year period 600 notices of noncompliance and suspension orders could be expected for Notice-level activity and 100 could be expected for Plan-level activity.

Administration Practices. The Proposed Action would change the regulations to include Stock Raising Homestead Act lands whose surface is privately owned but whose mineral estate has been retained by the Federal Government. These new regulations would be used to allow access to those lands for mineral resources but would apply only if the land owner and the mineral operator cannot agree on the development of the minerals. BLM's workload would increase with the development of Plans of Operations, but it is not clear how many of these plans would be submitted. Such increased workload, however, would exist under all of the alternatives because recent amendments to the Stock Raising Homestead Act mandates BLM's involvement whenever the surface owner does not consent.

The Proposed Action would require a mineral validity exam for any operation in an area under mineral withdrawal. Before BLM can allow operations to start, the exam must show that the operator has the right under the Mining Law to disturb surface resources. By not being allowed to begin operations until the exam has been completed, the company could lose revenue due to time delays. If the operation is contested and a mine is not developed, natural resources would be protected. BLM's workload would increase because of the exam requirement. The validity exam is an extensive process that can be completed only by BLM-certified mineral examiners.

Under the Proposed Action, if a mineral is suspected of being common variety, the operator might receive an interim authorization until a validity exam is conducted with a common variety determination. During the interim authorization, operators could either continue to sample their site and conduct yearly assessment work to meet Mining Law requirements and hold their claims. Or they could develop an escrow account in a form acceptable to BLM.

Developing an escrow account and depositing the fair market value of the material mined would allow operators to continue mining until the common variety determination has been completed. If the mineral is determined to be uncommon, the money would be refunded to the company, and the operator could proceed under the Mining Law. If the mineral is determined to be common and salable under the 43 CFR 3600 regulations, the money would be paid to the U.S. Treasury.

BLM's workload would be affected by these regulations through the review of the proposals and determination if the impacts have been minimized. BLM would have to review the operation to ensure that its has met the standards outlined in the regulations and determine if the impacts would be at the lowest practicable level. BLM's workload would increase, and under the current funding and staffing levels the project would be delayed. As a result, BLM might not be able to meet the 30 working day review time limit for a Plan of Operations.

Mineral Development. Implementing the Proposed Action is projected to decrease mining by 5% or less overall across the study area. These changes by operation type for the Proposed Action are shown in Table 3-12.

Table 3-12. Changes in Mineral Activity under Alternative 3

Recreational Mining	Small Exploration	Large Exploration	Small Placer	Large Placer	Small Open Pit	Large Open Pit	Small Under Ground	Large Under Ground	Industrial Minerals
<-5%	-5%	<-5%	-5%	<-5%	-5%	-5%	-5%	<-5%	<-5%

The largest potential decrease in mining could result when a Plan of Operations would be required for an operation that under the existing regulations would need only a Notice. The cost model for exploration (see Appendix E) projects a potential 30% increase in some exploration-based costs when a Plan of Operations rather than a Notice would have to be prepared.

Table 3-13. Number of Mineral Operations under Alternative 3 over a 20-Year Period

Type of Operation	Notices	Plans
Exploration	16,200	1,100
Placer	5,700	1,400
Strip	280	90
Open Pit	1,200	760
Underground	740	85
Mill Site	165	75
Totals	24,285	3,510

Table 3-13 outlines the possible number of Notices and Plans that could be submitted over a 20-year period for different types of mining operations under the Proposed Action.

The decrease in the amount of overall mining is again estimated at 5% or less. The decrease is not necessarily expected to be reflected in the overall number of operations on public lands. The expected changes could be absorbed by the mining industry through shorter mine life, high cutoff grades, discontinued exploration, and lower profits.

From these assumptions, an estimated 1,150 Notices and 190 Plans of Operations would be filed each year under the Proposed Action. Over a 20-year period, 23,000 Notices and 3,800 Plans of Operations would be filed.

Table 3-14 shows the average acreage that would be disturbed by Notice- and Plan-level operations under the Proposed Action

Table 3-14. Acres Disturbed under Alternative 3

	Acres Disturbed		
	Per Operation	Per Year	In 20 Years
Notice Level	2	2,200	44,000
Plan Level	144	9,500	190,000

Alternative 4: Maximum Protection

Administration of Surface Management Regulations. The use of technical design standards might reduce the flexibility that operations have under the existing regulations and could reduce the level of exploration and mining. BLM would outline to the operator which technical standards to use. If the standards fail to protect the environment, the industry could argue that it would not have to take remedial actions because it has followed the standards and completed the process exactly as outlined. The mining industry could further argue that it is not liable for the damage because of the failure or inadequacies of the technical standard.

Casual Use. Casual use could continue once BLM has reviewed the proposal and determined that an action is casual use or that a Plan of Operations must be submitted. Operators would either have to write or visit BLM to determine if the operation is causal use. Having to review proposals and make determinations would increase BLM's workload.

Notices. Alternative 4 would discontinue Notices.

Plans of Operations. All actions that do not meet the casual use definition would require Plans of Operations. Operators would have to plan more time to develop mining actions so that BLM could process them. Exploration would have more scheduling problems because it is based on current information that is being developed for a potential target. During exploration, information could change and require operators to change their exploration plans. These changes could delay drilling and the overall operation because of the wait for additional approval. These delays could be costly in time and money. Developing Plans of Operations would be a complicated and time consuming process.

Under Alternative 4 BLM could deny a mining permit under the following conditions: (1) the operation could not prevent irreparable harm, (2) reclamation of wetlands and wildlife habitat could not be completed within 10 years, (3) or water would have to be treated for more than 20 years after closure. These determinations would be based on predictive models and professional opinion, and the predicted impact might or might not occur. These decisions would restrict the mining industry from accessing minerals on public lands.

Alternative 4 would further restrict mineral entry by requiring BLM to perform validity exams for all operations and for common/uncommon variety minerals. Before approving Plans of Operations BLM would also have to develop a feasibility study for proposed mines to determine if mining would be feasible. Preparing these documents would be time consuming and require more expertise on BLM's staff. But these documents would give BLM the information for determining if the project should go forward before any land is disturbed.

Under Alternative 4 industry would use the best available technology and practices for actions on mining operations. These technologies might or might not directly apply to the mining industry.

Operations would also be required to post a bond for 100% reclamation and money for unplanned events. Calculating a bond for unplanned events would be difficult.

Reviewing Plans of Operations under Alternative 4 would increase BLM's workload. Under current funding and staffing levels projects would be delayed.

Inspection and Enforcement. Alternative 4 would require operators to have third-party contractors complete monitoring of the operation, and monitoring reports would have to be given to BLM for verification. The review of these documents would require more time and money for BLM.

As under the Proposed Action, Alternative 4 would allow the public to accompany BLM inspectors during compliance inspections, and the same impacts could result.

If an issue of noncompliance arises, BLM would be required to take enforcement actions and automatically penalize the operator. Penalties would be issued, and the working relationship between the operator and BLM could be strained. Mandatory penalties could make it difficult for BLM to attain compliance, would prohibit the approval of other permits, and would further strain working relationships. These types of automatic penalties could make it difficult for BLM and the operator to work out problems. On the other hand, penalties could keep some operations in compliance. Automatic noncompliance could increase the workload. An estimated 1,000 notices of noncompliance for mining are expected to be issued on public lands during a 20 year period under Alternative 4.

Administration Practices. Any appeal of BLM's decision would automatically stay the decision. The project would then have to be reviewed by the Interior Board of Land Appeals (IBLA) before the operation could continue. Historic data shows that this requirement could delay a project for up to 2 years. The use of appeals could create a backlog of cases and further delay IBLA's review and the operation. An appeal could be used to stop mining and could effectively shut down operations before they start.

Mineral Development. A mining decrease of 5% to 30% is projected to result from implementing Alternative 4. These changes are shown in Table 3-15.

Table 3-15. Mineral Changes under Alternative 4

Recreational Mining	Small Exploration	Large Exploration	Small Placer	Large Placer	Small Open Pit	Large Open Pit	Small Under Ground	Large Under Ground	Industrial Minerals
-5%	-20%	-15%	-15%	-10%	-25%	-30%	-15%	-10%	-5%

Table 3-16 outlines the possible number of Plan-level operations over a 20-year period for the following mining actions under Alternative 4.

Table 3-16. Number of Mineral Operations under Alternative 4 over a 20-Year Period

Type of Operation	Number
Exploration	14,600
Placer	6,400
Strip	360
Open Pit	1,575
Underground	1,260
Mill Site	230
Total	24,425

Under of these assumptions, as many as 1,100 Plans of Operations could be submitted a year under Alternative 4, and 22,000 could be submitted over a 20-year period. Table 3-17 shows acres that would be disturbed under these operations.

Table 3-17. Acres Disturbed under Alternative 4

Operation Size	Acres Disturbed per Operation	Acres Disturbed per Year	Acres Disturbed in 20 Years
Average Small	2	2,000	40,000
Average Large	50	7,800	156,000

Hazardous Materials and Waste Management

Affected Environment

Hazardous Materials Management

The term "hazardous materials" is defined in 49 CFR 172.101. Hazardous substances are defined in 40 CFR 302.4 and in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) Title III. Hazardous materials and substances may be transported, stored, and used at any mine. Typical processing chemicals include sodium cyanide, calcium oxide (lime), hydrochloric acid, antiscalants, flocculants, and sodium hydroxide. Cleaning solvents, blasting agents, and additional diesel fuel for mining equipment may also be used.

The Department of Transportation has compiled a list of materials classified as hazardous for transportation purposes (49 CFR 172.101) and prescribes packaging and labeling requirements for each designated hazardous material. This list includes the hazardous substances regulated under CERCLA as well as other types of chemicals. In addition to the hazardous substances described above, the transporting of sodium hydroxide, ammonium nitrate, class A explosives, diesel fuel, and calcium oxide (lime) must comply with Department of Transportation hazardous materials packaging and labeling requirements.

Storage of chemicals used in mining must comply with a variety of regulations and procedures. Fuel storage areas must be built with synthetic liners or a concrete containment area to store above-ground bulk fuel tanks. All other petroleum products and chemicals must be stored in lined containment areas with at least 110% secondary containment capacity. Lubricants are usually contained in a mobile service truck. Bulk lubricants and petroleum products must remain stored at the main mobile maintenance shop. Sodium cyanide is stored in areas physically separate from acid storage, and blasting agents and explosives must be stored and used on site according to Mine Safety and Health Administration regulations (30 CFR 56, subpart E). Users of blasting agents must maintain a valid Bureau of Alcohol, Tobacco, and Firearms permit.

Some mines are classified as large-quantity generators of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). A large-quantity generator generates more than 1,000 kilograms per month of RCRA-regulated hazardous waste (40 CFR 262). Other mines can be classified as conditionally exempt small-quantity generators of hazardous waste, as defined by RCRA. A small-quantity generator is a facility that generates less than 100 kilograms a month of RCRA-regulated hazardous waste.

Laboratory waste that exhibits hazardous waste characteristics, including off-specification commercial chemicals and assay wastes, are managed as hazardous waste. A short-term hazardous waste storage facility is built for storing these wastes for up to 90 days. Hazardous wastes are hauled to an approved facility for disposal.

Hazardous wastes other than laboratory wastes are also managed in the short-term storage facility before being shipped to an off-site licensed disposal facility. These materials may include waste paints, thinner, and spill cleanup items. Spent solvents and used oils are returned to recycling facilities.

Waste Management

Mining also generates nonhazardous waste. Most of this waste includes mill tailings, waste rock, spent leach ore, and solvent extraction and eletrowinning wastes ("SX/EW"). Mine waste are excluded from regulation as hazardous waste under the Resource Conservation and Recovery Act of 1976: 40 CFR 261, mining waste exclusion: final rule, *Federal Register* Vol. 54, No. 169, September 25, 1989: 40 CFR parts 260, 261, 262, Mining Waste Exclusion and Definition of Designated Facility; proposed rule, *Federal Register* Vol. 54, No. 184, September 25, 1989; 40 CFR 260, 261, 262, Mining Waste Exclusion; Section 3010 Notification for Mineral Processing Facilities; Designated Facility Definition; Standards Applicable to Generators of Hazardous Waste; final rule, *Federal Register* Vol. 55, No. 15, January 23, 1990. These wastes are managed on the mine site through the site-specific reclamation or closure plan. Their disposal method depends on their chemical nature and potential to generate leachate.

Nonhazardous wastes generated by mining include waste paper, wood, scrap metal, used tires, and other domestic trash. These materials are disposed of in designated landfills. These sites are usually developed onsite as part of the operating and reclamation plans and are covered under 40 CFR 268. Analytical procedures at an on-site laboratory generate hazardous and nonhazardous waste. Nonhazardous solid wastes from the laboratory are disposed of at the landfill.

To date, the Environmental Protection Agency (EPA) has not established a regulatory framework for regulating mining wastes under Subtitle D of the Resource Conservation and Recovery Act (RCRA). For purposes of this EIS, BLM assumes that this status will continue. If EPA does establish regulations for mining wastes, BLM would coordinate with EPA.

Emergency Response

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) creates a framework for the federal response to hazardous substance releases. For this program to be effective, the Federal Government must be informed immediately of releases that may require rapid response to protect public health and the environment. Notification is needed if an amount of a hazardous substance equal to or greater than its reportable amount is released to the environment within a 24-hour period. Following notification, federal workers evaluate the need for a federal response, and removal or remedial actions are initiated, if necessary. For emergency response planning under the Superfund Amendments and Reauthorization Act, Title III, a threshold planning quantity is established for each hazardous substance. The threshold planning quantity and reportable quantity values for sodium cyanide are 100 lbs and 10 lbs respectively. CERCLA excludes petroleum products as hazardous substances. If an operation is expected to store chemicals that

Table 3-18. Outline for Emergency Response Plan

I. Introduction

II. Emergency Coordinator Information; Emergency Phone Numbers (40 CFR 262.34 [d][5])

III. Preparedness, Prevention Contingency Plan
  1) PPC Plan (40 CFR 265, subpart C and ARS 26-347)
    A. Maintenance and Operation of Facility
    B. Required Equipment
    C. Testing and Maintenance of Equipment
    D. Access to Communication or Alarm Systems
    E. Required Aisle Span
    F. Arrangements with Local Authorities
    G. Transportation Routes
  2) Hazardous Waste Training for Employees
  3) Emergency Plan for Hazardous Materials
  4) Disaster Plan
  5) Acid Handling Procedures
  6) Emergency/safety Equipment Lists and Locations; Evacuation Plan and Routes
  7) Spill Prevention Control Countermeasure Plan
  8) Maps, Illustrations

exceed their threshold planning levels, an emergency response plan is required.

Mining operations that store, use, or generate regulated materials must have an emergency response plan as required by CERCLA (Table 3-18). Part of the emergency response plan is a spill prevention, control, and countermeasure (SPCC) pan. This plan would cover all materials stored at the mine site and must be reviewed and updated at least every 3 years, or whenever major changes are made in managing these materials.

The emergency response plan outlines actions that would be initiated, and by whom, in the event of a release or spill from an component of a fluid management system. The fluid management system includes the process recovery system, piping, pumping, ditches, and other items used in the managing and fluid containment of the leaching and processing facilities. The emergency response plan also applies to spills of stored chemicals and petroleum products. All chemicals must be stored and handled according to manufacturer recommendations and state regulations.

The material safety data sheets for all chemicals used on a mine site and emergency response plan and the emergency response plan itself should be kept where they are readily accessible by workers.

Release and Spill Reporting

The discoverer of a chemical of petroleum product spill or an accidental discharge from any component of the fluid management system must immediately shut down that portion of the failed system to eliminate the discharge and then notify his or her immediate supervisor. Procedures should then be followed, based on the time of the event, including other proper notification of mine workers, as specified in the emergency response plan.

The notification process usually entails contacting local, state, and federal people who have responsibilities in emergency response. Depending on the nature of the release or spill, equal to or greater than that of its reportable quantity, the National Response Center could be contacted. These notifications are based on local, state, and federal requirements and outlined in the emergency response plan.

Environmental Consequences

Impacts Common to All Alternatives

The storage of chemicals, hazardous waste, and other waste is regulated by the acts and regulations outlined previously. None of these alternatives would reduce the effectiveness of emergency responses to releases and spills. The risks of transportation accidents, equipment failure, and human error resulting in a spill or release would continue. The level of risk would be determined by the relative amount of activity and proximity to environmentally sensitive lands and habitats.

Alternative 1: No Action

The management of mine waste could affect natural resources. Under current law—the Bevill Amendment—these wastes would be exempt from the hazardous classification. Mine waste might not pass a nonhazardous standard, but it would still be handled as nonhazardous waste. Pond sludge is an example of mine waste that might be reclaimed in place and not be tested for heavy metals contamination. Depending on how materials are reclaimed, they might leach into soils and ground water. Soils could attenuate heavy metals that could be taken up by plants and placed into the food chain. Mine waste is difficult to manage because some operators are reluctant to test waste that is exempt from classification as a hazardous material. The test would allow BLM to determine the best method of reclaiming the site and avoiding potential pollution.

Alternative 2: State Management

In some states, mine waste might not be tested to determine the potential for contamination. Even mine waste that does not pass a nonhazardous standard would be handled as nonhazardous waste due to its regulatory exclusion. Without knowledge of the material's pollution potential, an operation might not be properly reclaimed. BLM, as land owner, might not know of the situation and might be held environmentally and financially liable for the cleanup if onsite disposal later degrades the environment.

Alternative 3: Proposed Action

Mining under the Proposed Action might not contaminate soils and sludges in tailings, leach ponds, and leach pads. Mine waste testing would determine the potential for generating unacceptable leachate. The testing would also ascertain the best approach to reclaiming the site. Depending on the success of reclamation over the long term, the site should not become contaminated.

Alternative 4: Maximum Protection

Under Alternative 4 the disposal of mining-related waste, i.e. pond sludges, would not be allowed, eliminating any potential impacts or additional cost to BLM. Expanded bond coverage could offset the government's cost in responding to and initiating removal or remedial actions for hazardous waste.

Climate

Affected Environment

The study area consists of several major climatic types. Temperatures vary mostly with latitude, elevation, moisture, and to a lesser extent local microclimate. At higher elevations in the study area freezing temperatures are possible throughout the year.

Annual precipitation is highly variable, due mainly to the orographic effect of local topography and the large-scale variability of storm tracks in respect to large water bodies. Except in coastal areas, the Pacific Southwest, and areas with high snowpack, most precipitation comes from thunderstorms in the spring to fall. Snowfall is possible at higher latitudes and elevations throughout the year, with snow accumulation amounts increasing with elevation.

Upper-level winds generally prevail from the west and southwest (with alternating southerly flow in the east), but ground-level winds often reflect local terrain. For example, the diverse and rugged terrain in mountains results in complex wind flows and surface winds. Synoptic (pressure gradient) winds may be channeled or forced around hills, but without strong gradient flows, diurnal upslope/downslope winds predominate. Upslope winds usually blow on sunny mornings when the air at higher elevations heats rapidly and rises. Downslope winds blow when the air near the ground cools, becomes dense, and sinks downward along drainages.

The extent of vertical and horizontal mixing is related to the atmospheric stability and mixing depth. Unstable conditions normally result from strong surface heating (typical of summer afternoons), producing vertical winds. Neutral conditions reflect a breezy, well-mixed atmosphere. Stable conditions (enhanced by rapid radiative cooling and downslope drainage, high pressure systems, etc.) produce the least amount of dispersion.

Although the atmospheric mixing varies throughout the study area, dispersion is normally good in spring and summer, but limited in winter. Inversions are formed under stable conditions, trapping air pollutants within a layer of the atmosphere. Moderate summer inversions are typical during the evening and dissipate at dawn. Winter inversions are stronger and last longer. Inversions are enhanced by weak pressure gradients, cold clear nights, snow cover, and lower elevations.

Public lands in the study area are found in several general climatic regions, including Arctic Alaska, Interior Alaska, Coastal Alaska, Coastal Pacific (North and South), California Central Valley, Columbia Plateau/Snake River Basin, Great Basin, Southwestern Desert, Wyoming Basin, Colorado Plateau, Western Great Plains, Eastern Temperate Plains, and Southern Subtropical Plains. In addition, microclimatic conditions make mountainous, highland climates highly variable, including the Cascade/Sierra Nevada Mountains, Northern Rocky Mountains, and Southern Rocky Mountains climatic regions. Even these regional climatic divisions are necessarily broad generalizations of highly complex conditions.

Environmental Consequences

Although mineral development does not affect climate, it is appropriate to examine the impact of climatic conditions on postmining vegetation reclamation (McKee and others 1981). Throughout most of the United States the timing and amount of precipitation are the main limiting factors for vegetation growth. Although temperatures also affect growth, warming temperatures typically dictate when growth begins, not if it will occur. Major exceptions to this assumption include coastal Alaska, the northern coastal Pacific, the eastern temperate plains, and the southern subtropical plains, where precipitation is abundant; arctic and interior Alaska and portions of the Cascades/Sierra Nevada, northern and southern Rocky Mountains, where extreme cold conditions inhibit plant growth; and portions of the Great Basin and the southwestern deserts, where extreme summer temperatures often create both spring and fall growing periods.

By comparing the short-term weather situation to long-term climatic conditions, vegetation managers can adjust the timing and methods for postmining vegetation reclamation. For example, dry soil conditions resulting from multiple years of below-normal precipitation will require excess moisture to adequately prepare vegetation for the growing period. Similarly, extended periods of summer moisture may compensate for a dry spring. Other biological relationships will determine the proper selection of seed and root stock, the occurrence and timing of plant development, and root growth.

Air Quality

Affected Environment

The air quality throughout much of the United States is unknown. Only limited monitoring data exists for most pollutants outside urban areas. But in the undeveloped regions of the West ambient pollutant levels are expected to be near or below measurable limits. Locations vulnerable to decreasing air quality from extensive development include immediate operation areas (mills, power plants, prescribed fires) and local population centers (automobile exhaust, residential wood smoke).

Carbon monoxide (CO) is formed by incomplete combustion of hydrocarbon-based fuels. Elevated CO levels are common in urban areas with significant transportation, residential, and industrial emission sources.

Historically, lead was added to gasoline, and elevated lead levels were found in areas with large numbers of automobiles. Today, elevated lead levels are found only in areas immediately next to operating (and historic) lead mines and smelters.

Nitrogen dioxide is formed when hot combustion gases are released quickly into the ambient atmosphere. Automobiles, fossil-fueled electrical generating facilities, and other industrial combustion are the major sources of nitrogen dioxide emissions.

Ozone is a secondary pollutant, formed under specific atmospheric conditions due to ambient levels of other primary emissions (such as volatile organic compounds and oxides of nitrogen). High ozone concentrations are typically found where these primary pollutants combine in strong sunlight and under relatively stable mixing conditions.

Sulfur dioxide is formed when hydrocarbons (or other materials) containing trace levels of sulfur are burned, including coal-fired electrical generating facilities, mineral products enhancement (such as smelting or roasting of ores), and other industrial combustion sources (particularly using diesel fuels).

Particulate matter concentrations are expected to be higher near industrial areas, towns, and unpaved roads. Inhalable particulate matter (PM^{10}) levels are high in areas with significant combustion sources (urban areas, industrial facilities, residential wood smoke).

Air quality regulations consist of the National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration (PSD) increments (Table 3-19). The NAAQS limit the amount of specific pollutants allowed in the atmosphere: carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, and inhalable particulate matter. The U.S. Environmental Protection Agency (EPA) recently established fine particulate matter ($PM^{2.5}$) standards, although it will take some time before background measurements and regional levels can be determined. Individual state standards include these parameters but may also be more stringent or include other air pollutants. Air pollutant concentrations are usually measured as micrograms per cubic meter.

Table 3-19. National Ambient Air Quality Standards and Prevention of Significant Deterioration Increments (g/m³)

National Ambient Air Quality Standards				Prevention of Significant Deterioration Increments		
Pollutant	**Averaging Time (a/)**	**Primary Standard (b/)**	**Secondary Standard (c/)**	**Class I**	**Class I**	**Class III**
Carbon monoxide	8-hour	10,000	10,000	—	—	—
	1-hour	40,000	40,000	—	—	—
Lead	Quarterly	1.5	1.5	—	—	—
Nitrogen dioxide	Annual	100	100	2.5	25	50
Ozone	8-hour	157	157	—	—	—
	1-hour (d/)	235	235	—	—	—
Sulfur dioxide	Annual	80	—	2	20	40
	24-hour	365	—	5	91	182
	3-hour	—	1,300	25	512	700
Particulate Matter (PM^{10})	Annual	50	50	4	17	34
	24-hour	150	150	8	30	60
Particulate Matter ($PM^{2.5}$)	Annual	15	15	—	—	—
	24-hour	65	65	—	—	—

Sources: 40 CFR 50.4 through 50.12; 40 CFR 51.166(c) and 52.21(c); 62 FR 38652 and 62 FR 38856 (July 18, 1997).

(a/) Annual standards are not to be exceeded; short-term standards may be exceeded once per year.
(b/) Primary standards are designed to protect public health.
(c/) Secondary standards are designed to protect public welfare.
(d/) The 1-hour ozone standards are to be implemented on an interim basis until the 8-hour standards go into full effect.

Areas that consistently violate the NAAQS because of human-caused activities are classified as "nonattainment" areas, and must implement a plan to reduce ambient concentrations below the maximum pollution standards. Under EPA's "Fugitive Dust Policy," areas that violate particulate matter standards but lack significant industrial or population particulate sources to cause such violations are designated "unclassified" (neither attainment nor nonattainment).

Most rural areas of the country have been designated as either attainment or unclassified for all pollutants.

As required by the Federal Land Policy Management Act and the Clean Air Act, BLM cannot conduct or approve any activity that does not comply with all local, state, tribal, or federal air quality laws, rules, standards, and implementation plans. Therefore, before any activity potentially affecting air quality can be approved and conducted, project-specific air quality assessments must be conducted to confirm that all requirements will be met. In addition, for activities proposed within nonattainment or maintenance areas (previous nonattainment areas that are now achieving or maintaining the NAAQS), BLM must conduct a separate "conformity" analysis and disclose potential air quality impacts and show that those impacts would meet all requirements.

The Prevention of Significant Deterioration (PSD) program applies in "attainment" and "unclassified" areas, whereby areas are classified by the additional amounts of nitrogen oxide, sulfur dioxide, and PM^{10} (inhalable particulate matter) degradation that would be allowed above a legally defined "baseline" level. PSD Class I areas, predominately national parks and large wilderness areas, have the greatest limitations; virtually any more degradation would be significant. Areas where moderate, controlled growth can take place were designated as PSD Class II. PSD Class III areas allow the greatest degree of impacts, although no PSD Class III areas have been designated to date.

Congress designated 157 mandatory Class I areas on August 7, 1977 (Figure 3-1; EPA 1979). Several Indian tribes have also redesignated their lands to PSD Class I. Most mandatory PSD Class I areas are in the mountainous regions (although some are also at lower elevations), and are managed by either the Forest Service, National Park Service, or U.S. Fish and Wildlife Service. One mandatory PSD Class I area is jointly administered by BLM and the Forest Service (Dome Land Wilderness in Southern California). Otherwise, most BLM-administered lands are classified PSD Class II.

Environmental Consequences

Impacts Common to All Alternatives

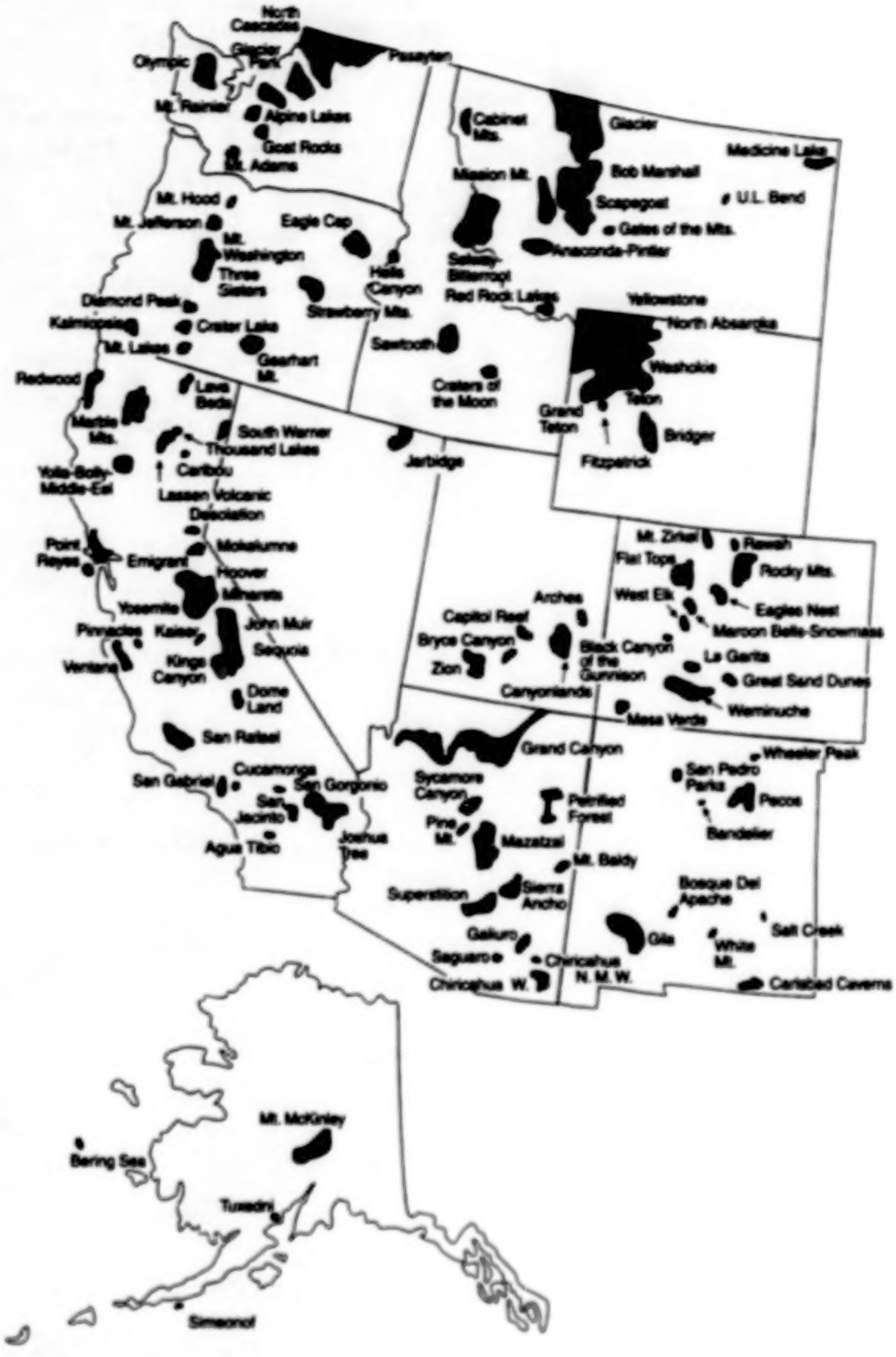
No specific provisions in the regulations would directly affect the amount and type of impacts to air quality under the four alternatives. Impacts to air quality would result from secondary effects of the regulations on the amount and type of mining activity.

The most significant impacts to air quality under all alternatives would result from direct development (extraction, transport, processing), mineral products enhancement (refining, smelting, roasting, combining), and postmining reclamation. Direct impacts could include increases in noise, dust, and exhaust generated by surface preparation, blasting, extracting, crushing, hauling, secondary processing, and transportation/loadout activities. Depending on the type of material extracted, further enhancement processes can generate large levels of gaseous and particulate matter pollutant emissions, often with relatively tall emission stacks, which can degrade air quality (pollutant concentrations and secondary impacts to visibility and atmospheric deposition) over large areas. Finally, as mining diminishes, continuing particulate matter impacts can be significant due to windblown (or fugitive) dust, until adequate postmining reclamation and vegetation are established and maintained.

Impacts from direct development and product enhancement could be significant

Figure 3-1

Mandatory Prevention of Significant Deterioration (PSD) Class I Areas (Source: EPA 1979).



(depending on project-specific conditions) but would exist only during the period of development (life of project). Disturbed-land impacts would typically be smaller in scale but could continue until successful postmining vegetation is established.

Because BLM can approve only activities that comply with all local, state, tribal, and federal air quality laws, rules, standards, and implementation plans, this analysis assumes that impacts to air quality would meet these standards. Although the precise air quality impact from mining cannot be measured now, these procedures would assure that BLM-authorized practices conform to all air quality requirements.

Alternative 1: No Action

Impacts to air quality would continue at approximately current levels and would be generally proportional to the amount of activity and acreage disturbed. All operations would continue to meet air quality standards as required under the Clean Air Act, state regulations, and the existing 3809 regulations.

An evolving practice used to facilitate metal recovery from sulfide ores is to roast the ore to oxidize and remove the sulfur. This practice emits sulfur dioxide. As part of a general trend, precious metals are being extracted from deeper portions of ore deposits, which contain higher amounts of sulfide minerals. This trend is expected to continue, and sulfur dioxide would be an increasing component in emissions of many mining operations. Although emission levels would continue to be limited under permit systems, sulfur dioxide emissions from the mining sector would increase.

Alternative 2: State Management

Impacts under State Management would be similar to those under No Action. All operations would continue to meet air quality standards as required under the Clean Air Act and state regulations. The projected increase in mineral activity by about 5% would result in a proportional increase in the emission of air pollutants. Although projects would continue to be required to meet standards, there would be a proportional cumulative increase in overall emissions.

Alternative 3: Proposed Action

Impacts under the Proposed Action would be similar to those under No Action. All operations would continue to meet air quality standards as required under the Clean Air Act and state regulations. The projected decrease in mineral activity by about 5% would result in a proportional decrease in the emission of air pollutants. In addition, the reclamation measures required by the proposed regulations would improve the reclamation success rate and shorten the amount of time that disturbed areas would be left unreclaimed, thus decreasing the potential for fugitive dust emissions. Projects would continue to be required to meet standards, and there would be a proportional cumulative decrease in overall emissions.

Alternative 4: Maximum Protection

The projected decrease of up to 30% in overall mineral activity and acreage disturbed under Maximum Protection would result in a proportional decrease in the emission of air pollutants. But offsetting this decrease would be the requirement for complete backfilling of all open mining pits. This backfilling would create more fugitive dust and equipment exhaust emissions. On the other hand, restricting the mining of high-sulfide ores would decrease the potential for sulfur dioxide emissions. In summary, projects would continue to be required to meet standards, and there would be a proportional cumulative decrease in overall emissions.

Water Resources

Affected Environment

Regional Hydrogeology

The United States can be divided into several ground water regions, each having similar characteristics for the occurrence and movement of ground water (Heath 1984).

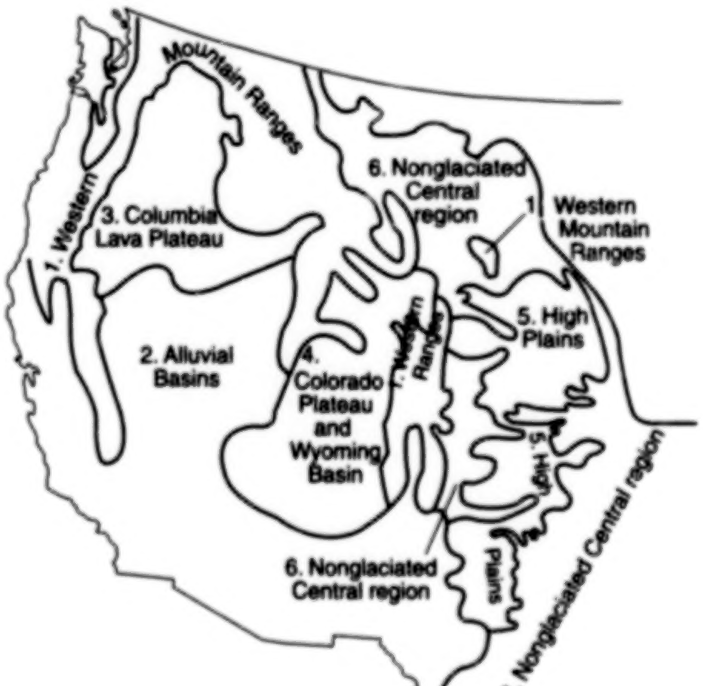
Great Basin And Southern Alluvial Valleys. This province includes most of Nevada and parts of eastern and southern California, western Utah, southern Arizona, southwest New Mexico, and small areas in southeast Oregon and Idaho. This region closely approximates the boundaries of the Basin and Range Physiographic Province described by Fenneman (1931), except in New Mexico. The characteristic physiographic features of the Basin and Range Province are the north-south trending mountain ranges and intervening basins filled with alluvial deposits that can be thousands of feet deep.

This region's ground water occurs in aquifers that are not continuous, or regional, because of the region's complex faulting and the many impermeable mountain ranges that often impede ground water flow between basins. But some basins are part of multi-basin flow systems connected by perennial streams or by subsurface flow through the basin fill or permeable bedrock that separates the basins. Ground water flow through these systems can be continuous for hundreds of miles.

Three main aquifer types collectively referred to as the Basin and Range aquifers (Planert and Williams 1995) are volcanic-rock aquifers, which consist mainly of tuff, rhyolite, or basalt of Tertiary age; carbonate-rock aquifers, which are mainly limestones and dolomites of Mesozoic and Paleozoic age; and basin-fill aquifers, which are mainly unconsolidated to semiconsolidated sand and gravel of Quaternary and late-Tertiary age. Older basin-fill deposits are generally deeper, are more consolidated, and can be less permeable (conglomerate, sandstone, siltstone,

Figure 3-2

Ground Water Regions Delineated by Heath (1984).


Mountain Ranges
1. Western
3. Columbia Lava Plateau
2. Alluvial Basins
6. Nonglaciated Central region
1. Western Mountain Ranges
1. Western Ranges
5. High Plains
4. Colorado Plateau and Wyoming Basin
5. High Plains
6. Nonglaciated Central region
6. Nonglaciated Central region

mudstone, freshwater limestone, evaporite beds, tuff, and interbedded lava flows). Any or all of these three aquifer types may be in or underlie a basin and constitute three separate sources of water. The aquifers, however, may be hydraulically connected to form a single source. Other rock types within the region (such as schists, granites, shales) have low permeability and block the flow of ground water.

Except for small areas that drain to the Colorado River, no streams that originate within the Basin and Range Province carry water to the oceans. Practically all the precipitation that falls in the area is returned to the atmosphere by evapotranspiration, either directly from the soil/alluvium or from the many lakes and playas in the lowest points of the basins.

The centers of many basins consist of flat-floored, vegetation-free areas known as playas onto which ground water may discharge and on which overland runoff may collect during intense storms. The water that collects in these playas evaporates relatively fast, leaving a thin crust deposit containing soluble salts that were dissolved in the water (Heath 1984). These water bodies represent discharge points for the alluvial aquifers (Planert and Williams 1995).

This region is the driest area in the United States. Large parts of it are classified as semiarid and arid. Annual precipitation in the valleys in Nevada and Arizona ranges from 4 inches in the low-lying valleys to 16 inches in some of the high valleys. In the mountainous areas throughout the region precipitation ranges from 16 to 35 inches on the highest peaks (USGS 1985).

Water quality of unconsolidated aquifers in the Basin and Range area varies from basin to basin. Water is generally fresh at basin margins and on the slopes of alluvial fans. Dissolved solids concentrations in these areas are generally less than 500 mg/liter. Locally, saline water is present near some thermal springs and where basin fill aquifers contain large amounts of soluble salts, such as aquifers in the upper and middle parts of the Humboldt River Basin. In discharge or sink areas, such as the Carson and Salton sinks and in parts of Death Valley, the dissolved solids concentrations can exceed that of sea water (35,000 mg/liter). Ground water beneath playas in small closed basins may be brackish, but typically the dissolved solids concentrations are not as high as those in major terminal sinks. Although highly mineralized water is common beneath playas, a deeper fresh water system might be present in some areas (Planert and Williams 1995). Water in bedrock units is generally of good quality, with some variations depending on the rock type and the flow path.

Western Mountain Ranges. This region includes a large extent of mountain ranges in an arc from the Sierra Nevada in California, north through the Coast Ranges and Cascade Mountains in Oregon and Washington, east and south through the northern Rocky Mountains in northern Idaho and western Montana, and south into the Bighorn Mountains in Wyoming and the Wasatch and Uinta mountains in Utah (Figure 3-2). Collectively this area is referred to as the Western Mountain Ranges ground water region as described by Heath (1984). These mountain ranges surround the Columbia Plateau regional aquifer, a large area of basalt flows. Most of the area is drained by the Columbia River, its tributaries, and other streams that discharge to the Pacific Ocean. Exceptions are streams that flow to closed basins in southeast Oregon and northern Nevada and to Great Salt Lake in northern Utah (Whitehead 1994).

The region also includes the southern Rocky Mountains, which extend from Laramie, Wyoming, south through central Colorado into the Sangre de Cristo Range in northern New Mexico. The mountain ranges generally consist of granitic and metamorphic rocks flanked by consolidated sedimentary rocks (mainly sandstones, shales, and limestone). Narrow intermontane valleys are filled with relatively thin, coarse, bouldery alluvium eroded from the higher slopes. The larger valleys (intermontane structural basins and down faulted troughs) are filled with moderately thick deposits of coarse-grained alluvium deposited by streams washing down from the mountains (Heath 1984). These deposits often form thick alluvial fans along mountain fronts and are recharge areas for water moving into the basin sediments.

Intermontane valleys contain unconsolidated alluvial deposits consisting mainly of sand and gravel layers that can supply large amounts of water to wells. Many large-yield public supply wells and thousands of domestic wells have been drilled in these units. These aquifers are generally not on public land.

The mountains in this region are not considered principal aquifers. Ground water is of limited availability, adequate for domestic use and livestock watering. Ground water in some of the intermontane valleys is more abundant and provides water to wells for large-yield irrigation supplies. Some unconsolidated aquifers occur along stream channels and provide limited amounts of ground water. Depths to ground water can range from a few feet near streams and in the mountains to several hundred feet in the sedimentary deposits that fill the intermontane basins.

Precipitation is high in the mountain ranges of both Oregon and Washington. Up to 160 inches of rain falls annually on the western slopes of the Coast Range. Up to 140 inches of rain falls in the highest peaks of the Cascade Range. In eastern Oregon and Washington, rainfall is much less; some areas record less than 10 inches of precipitation.

The mountains in western Montana receive a little over 100 inches per year precipitation at the highest elevations. Much of the lower mountainous areas receive 12-40 inches of precipitation annually. Streamflow is highest from May through June because snowmelt increases flow during the spring and early summer (USGS 1985).

In Wyoming, precipitation is highest in the northwest, averaging about 40 inches per year in the highest mountains. Elsewhere in Montana's lower mountains and plains, precipitation amounts to about 7 inches per year. Major streams in the mountains are the Snake, Bighorn, and Wind rivers (USGS 1985).

Surface water is sustained largely by snowmelt in the mountainous western two-thirds of Colorado. Runoff in the western mountains is highest during spring and early summer, the result of melting snowpack in the Rockies. Mountain precipitation ranges from 12 to more than 30 inches per year. Intermontane valleys receive 8 to 12 inches per year. The Colorado River and its tributaries drain most of the mountain areas. The Arkansas River and Rio Grande and their tributaries drain the region's south.

Colorado Plateaus and Wyoming Basin Aquifers. The Colorado Plateaus aquifers underlie most of western Colorado, northern New Mexico, northeast Arizona, and eastern Utah. The Wyoming Basin includes south-central Wyoming (Figure 3-2). In general, the aquifers in this region consist of moderately to well-consolidated sedimentary rocks that are permeable and capable in places of storing and transmitting large amounts of ground water. Most of the aquifers consist of sandstone, but limestone, volcanic rocks, and unconsolidated alluvium also contain water in a few places (Driscoll 1986). The region's main sources of ground water (sandstones) contain water in both primary and secondary porosity in interconnected pore spaces and in fractures. The main aquifers of this region are (1) the Uinta-Animas aquifer, (2) the Mesaverde aquifer, (3) the Dakota-Glen Canyon aquifer, and (4) the Coconino-DeChelly aquifer. Some locally productive and important aquifers throughout the region are not part of these units (Robson and Banta 1995).

Relatively impermeable confining units separate each of the main aquifers in the Colorado Plateaus. The two thickest confining units are the Mancos shale, which underlies the Mesaverde aquifer, and the Chinle-Moenkopi formations, which underlie the Dakota-Glen Canyon aquifer system (Robson and Banta 1995).

Unconsolidated deposits are of relatively minor importance as aquifers in the region. Thin deposits of alluvium capable of yielding small to moderate amounts of ground water occur along parts of the valleys of major streams, especially next to the mountain ranges in the region's north and east (Heath 1984).

Water levels are generally a few hundred to several hundred feet below ground surface, except in the alluvial deposits near streams, where ground water is generally a few feet to a few tens of feet below ground surface.

Surface water is characterized by sharply incised valleys with many ephemeral streams that drain the lower mountain ranges. Average annual precipitation ranges from about 8 inches in the lower valleys to 40 inches in the highest mountain crests. Major drainages are the Colorado, Yampa, and White rivers in Colorado and the Green River in Wyoming.

Columbia Plateau. The Columbia Plateau, in the ground water region referred to as the Columbia Lava Plateau (Heath 1984), includes a small area in northeast California, eastern Washington and Oregon, and a small area in northern Nevada (Figure 3-2).

The region has sequences of lava flows, ranging in thickness from 100 feet next to the bordering mountain ranges to more than 3,200 feet in south-central Washington and southern Idaho (Heath 1984). The lava flows form the region's main aquifer.

Unconsolidated-deposit aquifers are important sources of high-yield wells in some areas, capable of producing several thousand gallons per minute. Yields are more commonly less than a 100 to a few hundred gallons per minute.

Surface water abounds in the region, with many rivers developed for irrigation and recreation. The area is drained by the Columbia and Snake rivers, their tributaries, and other streams that discharge to the Pacific Ocean (Whitehead 1994). Some drainage is into southern Idaho, and perhaps northern Nevada.

Much of the Columbia Plateau region is in the "rain shadow" east of the Cascade Range. As a result, precipitation is limited over much of the area. Precipitation in the region ranges from 7 to 47 inches per year, but much of the area receives less than 20 inches per year. Many of the smaller streams are dry by summer's end.

Impact of Mineral Activity on Water Resources

Exploration for mineral deposits involves such activities as drilling; developing shafts, inclines, or adits into the ore deposit; and digging test pits or trenches. Drill holes from this type of activity can affect water resources. If the drill hole is not plugged or is improperly plugged, water from different aquifers could mix. This mixing could degrade the water quality of all or several of the aquifers.

Hydrologic investigations are sometimes part of an advanced exploration phase, requiring the drilling of water wells for aquifer tests to evaluate the expected aquifer zones or to evaluate aquifer characteristics. Monitoring wells may be installed to monitor ground water levels before mining. Determining water quality before mining is often part of the final phase of exploration and ore delineation.

These activities normally would not seriously affect water resources except in rare cases. Large amounts of water are sometimes pumped during the late exploration phase to test aquifers or to remove water from development workings. Discharge of the pumped water can be of concern if the water quality is poor. Pumped water is sometimes reinjected or infiltrated back into the ground using ponds. The disposal water can contain elevated levels of soluble salts, trace metals, and chlorides.

Mining can degrade ground and surface water quality and quantity in several ways. Each mining operations has mining features such as extraction areas and mill facilities each of which can affect water resources.

- Mineral extraction areas or pits for removing mineral material for processing. These extraction areas affect water resources through dewatering, creation of pit lakes, aquifer disturbance, and physical removal or rerouting of water courses. Ground water quantity is affected by the removal of ground and surface water through dewatering.
- Waste material storage in either tailings impoundments or waste rock dumps where high-volume waste material is placed. Waste materials affect water resources though acid rock drainage, spills or leaking of ponds, and other leaching of heavy metals.

- Chemical or physical processing plants that extract or concentrate the desirable mineral for refinement or use. These plants include heap leach facilities, placer gold separators, and flotation plants. Water resources are affected through chemical spills and leachates from processed material.

- Ancillary facilities such as access roads, powerlines, lab buildings, maintenance sheds, and other facilities and features needed for mining. Water resources are affected mostly through erosion and increasing sediment loading during runoff events.

Dewatering. Required when mining below the water table, dewatering is the process by which the operator pumps ground water around the pit area until the water table is below the operating mine pit floor. Mineralization usually occurs in areas of significant faulting and fracturing of the rock strata. As a result, mining sometimes intercepts highly permeable zones, with resulting high inflows of water into the excavation area. To maintain a dry pit during mining, several wells are installed near the mine and pumped at high rates to lower the water table below the levels that will be mined. Where there is a hydraulic connection (no impermeable geologic unit separating the shallow aquifer and the deeper aquifer) between the overlying alluvium and the mined aquifer, pumping can lower water levels in the overlying alluvial aquifer as well. Ground water sometimes seeps into a pit from the overlying alluvial deposits or enters directly into the pit from the exposed pit walls.

The effects of dewatering may not be evident for several years, until the cone of depression deepens and expands. In the initial stages of dewatering, the cone of depression can be restricted to the mine area. As the pit is deepened and pumping rates increase, the extent and magnitude of drawdown increases, sometimes expanding to a radius of several miles. The amount of decline and extent of the cone of depression depends on the pumping rate and the physical and hydraulic characteristics of the aquifers intercepted by mining. In strata where transmissivities are low, the cone of depression would be deep but limited in extent. Where transmissivities are high, the cone of depression could be widespread but would typically be shallow.

Dewatering requires high pumping rates. At the Betze Pit Mine (gold) north of Elko, Nevada, peak dewatering rates of slightly more than 100,000 gallons per minute (gpm) are expected. Pumping for dewatering is required to continue for several years, although not at the maximum rate. At the Lone Tree Mine initial pumping rates of 10,000 gpm were used, increasing to 30,000 gpm a few years after mine production began and will be increasing to the maximum of 75,000 gpm (BLM 1995b).

Effects on Streamflow. Dewatering of aquifers can affect streamflow by either lowering shallow ground water in alluvial channels along streams or by lowering water levels in deeper aquifers that are hydraulically connected to the stream. Dewatering the alluvium reduces streamflow by inducing infiltration through the alluvium in the channel. Lowered ground water levels in deeper aquifers can sometimes eliminate discharge from the aquifer to the stream channel. Spring flow can also cease, resulting in a decrease in or the complete loss of streamflow, if the stream depends on spring discharge. Hydrologic effects are more pronounced near the mine because of greater drawdown near the dewatering wells (Crompton 1995).

Effects on Springs. Dewatering does not always result in springs drying up or having reduced flows. Because many springs are in mountainous areas and are the result of perched, shallow flow systems that are not connected to the regional aquifer system, some springs are unaffected by lowered ground water levels caused by dewatering (Crompton 1995). When springs are affected, most of the effects are observed near the mine and the dewatering well field. Effects on springs can occur several miles away if a spring is supplied by a shallow flow system.

Effects on Shallow Ground Water. Shallow ground water is expressed by the presence of grasses and shrubs. Generally, water levels less than 15 feet below the ground surface are considered to be in the shallow ground water system (Crompton 1995). As with springs, dewatering effects are more pronounced near the mine and at the dewatering wells. Impacts to the shallow ground water system can be observed within a radius of several miles around the mine and dewatering well system.

Effects on Agricultural Irrigation. Drawdown due to irrigation wells can be significant, ranging up to 80 feet depending on pumping rates and aquifer conditions. The effects of mine dewatering could further lower water levels and affect the economics of farming by increasing the costs of pumping irrigation water. Effects on agriculture are not common in the Humboldt River Basin Nevada (Crompton 1995). Dewatering can potentially occur in the study area wherever a large open pit is located, but impacts are concentrated in Nevada because of the number of large, deep open pits there.

Pit Lakes. When mining ceases in an open pit being mined below the water table, dewatering is no longer required, and pumps are turned off. Ground water then begins to flow back toward the mine, driven by the hydraulic gradient of the lowered water level at the mine. Several decades may be required before the ground water system approximates premining conditions. As the pit fills, mineral constituents will be leached and transported into the pit with the ground water flow. The ultimate composition of pit lake water quality is variable, depending on the host rock for the ore, the type of ore deposit, the water type, the rates of inflow, climatic conditions, and the reactions between the pit wall and ground water. Water of lowered pH often results.

Pit lakes may become alkaline in desert environments due to the high evapoconcentration and the low levels of sulfides. Climatic conditions are an important consideration in estimating pit lake water quality. Evapoconcentration in desert environments can change the chemistry of shallow pit lakes. Geothermal water flowing into the pit can cause stratification and overturning of the lake. Reaction with the wall rock is an important factor in determining pit lake water quality (Macdonald and others 1994). Ground water outside the pit may be affected if the regional hydraulic gradient moves water through the pit and away from the mine. Fluctuations of water level in the pit can change the direction of flow from or into the pit.

Experience with precious metal pit lakes is limited, especially deep pits that are only recently being developed. Most of the deep open pit mines in Nevada are still in production and in the process of dewatering the aquifer (Macdonald and others 1994). Currently eight pits lakes are on public lands in Nevada. Pit lakes also form in copper and uranium mining. Water in open pit uranium mine lakes is generally unfit for any use (Macdonald and others 1994).

Ground water quality surrounding many pit lakes is not expected to be affected for several years or decades after pumping stops. The time required for possible impacts to the surrounding ground water quality would vary, depending on the hydrology at the mine site. Normally, ground water flows into the pit for several years after mining, sometimes requiring decades for the ground water system to reach premining or steady-state conditions. Contaminants do not flow out of the mine pit lake until the hydrologic regime reaches steady state (equilibrium with the flow system). Once steady-state conditions are achieved, ground water might begin to flow out of the mine pit in the direction of the regional hydraulic gradient. At some mines, flow-through conditions can occur early after pumping stops, and the pit is only partially refilled.

Predictions of pit water quality apply geochemical models that use data from laboratory tests of rock content, acid-generating capacity, and hydrologic monitoring data. Important factors that affect water quality in mine pit lakes include pyrite oxidation and acid generation in the pit walls, leaching of metals from wall rock, chemical reactions and evaporative concentration in the water, and chemical and oxygen distribution in the final lake. Water quality in pit lakes changes over the course of filling due to interaction of pit lake water with different zones of alteration in the pit walls.

Some pit lakes are close to neutral in pH and do not turn acidic. At the Nickel Plate Pit (a gold deposit) near Hedly, British Columbia, for example, the pH of the pit lake is 7.8-8, and the lake has not turned acidic (Macdonald and others 1994). At perhaps the largest expected pit lake in North America, the Betze Pit in Nevada, which is still an active mine, the final pit water quality is not expected to be acidic (Drever 1991). At the Cortez Mine pit lake in Nevada, bass planted in the lake years ago are still living there. The fish have no apparent secondary food source, suggesting that the pit lake has enough primary productivity for a food chain that supports the fish (Macdonald and others 1994). But this pit lake is relatively shallow (about 80 feet deep), and conditions differ from deeper pits where lakes will be about 1,000 feet deep. Several other pit lakes in Nevada are predicted to have water in the neutral range of pH or slightly alkaline. If lakes are alkaline, water quality problems can also develop with elevated levels of contaminants such as arsenic, selenium, molybdenum, vanadium, and nickel.

Attenuation processes can sometimes reduce the contaminants migrating out of the pit. Some studies have shown that attenuation is an important process in reducing concentrations of contaminant plumes but may not always be effective in attenuating all of the contaminants. At the Lone Tree Mine, for example, seepage from the pit lake into the surrounding aquifers is not expected to affect ground water quality because of expected attenuation of the contaminants (BLM 1995b).

Mine pits high in sulfide rock tend to have poor quality water. The pH may be low (acidic) or high (alkaline), depending on the amount of acid-neutralizing and acid-generating capacity of the sulfide rocks. Oxidized mineral zones that contain appreciable amounts of carbonate rock are likely to produce near-neutral pH water quality (near pH 7.0). Because deeper mines are more likely to encounter sulfide minerals, the potential for poor water quality in pit lakes in these deposits is increased. Water quality in pit lakes can be a transient phenomenon, especially in deep pits. Water inflows in the early stages of refilling can become acidic because of the flow through of the sulfide minerals that have oxidized in the pit walls. But as the pit fills, water can encounter acid-neutralizing rock that makes the pH more neutral if the rock has sufficient neutralizing capacity (Miller and others 1996).

Impacts to ground water down gradient from a mine depend on whether the pit lake is in a flow-through system or a terminal flow system. In a flow-through system, ground water flows into the mine pit and passes out of the pit, migrating down gradient away from the pit lake. In a terminal flow system, the pit captures all ground water that flows within a certain distance of the pit, but water does not pass through the pit. Pit lakes can have terminal flow during filling but then change to flow-through conditions after the pit lake fills to the level of premining hydrologic conditions.

Backfilling of mine pits is one method of reclamation for open pit mining. But backfilling may not always be the preferred option for reclamation where the backfill will be saturated after mine refilling. The resulting water quality might become further degraded due to the leaching of metals and other constituents from the broken and crushed rock in the backfilled material.

Managing the backfilled material (i.e. segregating rock types and placing acid-forming rock types within areas of acid-buffering rock) is important in any attempt to backfill a pit. A full understanding of the regional ground water flow system in mined areas is important so that ground water flow through closed pits can be more accurately estimated. In addition, backfilling requires an understanding of the potential water-rock interactions that may take place to predict water quality and pH in the backfilled pit after filling. Whether the water turns acidic is not the only concern. Alkaline or high pH conditions can also create water quality problems with elevated levels of arsenic, molybdenum, uranium, vanadium, manganese, and nickel.

Aquifer Disturbance. Aquifers can be disturbed by mining operations during exploration and development, but most of the impacts occur during the developing of extraction areas. Open pit mining and to some extent strip mining removes the permeable geologic strata that may serve as aquifers. Large sections of aquifers can be removed during either open pit or strip mining. Geologic materials can be replaced in the excavation as backfilling material, but the geologic materials would not be the same as in the original aquifer. Ground water might not flow through these materials as readily as before, or might flow more easily, depending on the material's hydraulic characteristics. As a result, the local ground water flow system could be disrupted. Ground water flow paths on a local level could be altered, possibly changing the ground water regime in the mined area.

Physical Disturbance of Surface Hydrological Systems. Impacts to surface water resources could include changes in water quality, disruptions to the ground water flow system supporting riparian vegetation, and changes to stream channel geometry. Surface water courses are diverted from their historic channels and rerouted around the mine if they cross the proposed mine area. These channels might be replaced after mining operations are completed through reclamation. But these channels usually do not have the same morphology as the original channel or stream. The floodplain deposits through which the stream channel passes could affect streamflow characteristics, increasing erosion and changing the frequency and duration of floods. Disrupting the stream channel could destroy the surface water-ground water interaction, harming riparian vegetation.

Acid Rock Drainage. Acid rock drainage (ARD) results from weathering reactions between sulfide-bearing rocks, air, and water to generate sulfuric acid. Acid rock drainage is characterized by low pH; increasing acidity; and elevated heavy metals, sulfate, and total dissolved solids in drainage waters emanating from the sulfide rock source. Acid rock drainage can affect water by lowering pH, dissolving minerals, and releasing toxic metal cations (e.g. lead, copper, silver, manganese, cadmium, iron, and zinc). The mobility of heavy metals is also increased in a low pH environment, which allows their transport by ground or surface water. Acidic conditions can be generated in underground mines or in pit lakes formed after open pit mining has ceased.

Acid generation at mines is largely the result of oxidation of metallic sulfides. The major metallic sulfide of concern is iron sulfide (FeS2), or pyrite. Other metal sulfides can also contribute to acid generation: galena (lead sulfide), sphalerite (zinc sulfide), and chalcopyrite (iron copper sulfide) (EPA 1997).

Pyrite oxidation is a self-maintaining mechanism. The rate increases with lower pH, which results in the oxidation of more pyrite, generating more oxidation agents, which further lower the pH, continuing the cycle. This process can originate from mine pit walls, mine shafts, tunnels, or waste dumps, and can theoretically continue until all the available sulfide has been oxidized. This process can possibly take centuries or millennia to run to completion (Bird 1993). The reaction process can be slowed significantly by cutting off the water or oxygen supply to the sulfide-bearing minerals.

The oxidation process that generates sulfuric acid normally progresses slowly, but the presence of bacteria can accelerate the process. Biological oxidation enhanced by *Thiobacillus ferrooxidans* and other organisms can increase the oxidation rate by 50 to 1,000 times or more. The time required for acidic conditions to develop depends on the amount and character of the sulfides present, and the alkali minerals available for neutralization (EPA 1996).

The ability of a rock sample to generate net acidity is a function of the relative content of acid- generating and acid-consuming minerals and their size, shape, and distribution throughout the deposit. Typical sediment-hosted precious metal deposits in Nevada contain acid-generating and acid-consuming minerals. The balance between the two determines the extent to which rock-water interaction produces acidic water (Bird 1993).

Recorded pH values from acid rock drainage are as low as *less* than -1.0 (Iron Mountain, CA), but acid rock drainage rarely attains levels below a pH of about 2.0 and typically is in the range of 2.0-4.0 (Bird 1993).

No easy or inexpensive solutions exist to acid rock drainage. Two main approaches to addressing acid generation are (1) avoiding mining deposits with high acid-generating potential and (2) isolating or otherwise special-handling wastes with acid-generating potential.

Physical, chemical, and biological controls can be used to prevent, minimize, and treat acid rock drainage. The best environmental controls and the least expensive in the long run are waste management practices that focus on prevention rather than treatment. Acid rock drainage can be treated using two strategies: (1) active chemical treatment of acid by-products or (2) elimination of acid-generating reactions (SME 1998). For waste piles, the use of covers to isolate the wastes from precipitation and to reduce the interaction of oxygen with pyritic mining wastes is an effective means of slowing the generation of acidic drainage from the waste pile. But this method may not be totally successful, and active treatment may still be needed.

For underground mines, bulkhead seals have been used to minimize oxygen flow into mine workings. Preventing oxygen from contacting sulfide mineralization inside the mine workings can greatly reduce the amount of acid and sulfate products that are generated (SME 1998). Fractures and fault zones within underground mines can also be grouted to reduce the contact of oxygen and water with sulfide mineralization and thus reduce acid generation, the volume of water in the mine, and the chance for leakage through fractures or around the bulkhead.

Although testing methods used to predict acid rock drainage have improved in recent years, there is often substantial uncertainty in the results, and mines can sometimes develop unpredicted acid rock drainage after only a few years.

Tests to predict acid-generating potential are classified as static or kinetic. Static tests are conducted quickly and are based on determining the balance between acid generation and acid neutralization. Kinetic tests mimic weathering processes in the environment, at an accelerated rate. Kinetic tests should be conducted for at least 20 weeks and might be required for much longer—a year or more in some cases is required to get reliable results. But kinetic tests don't consider the accelerated reaction rates due to catalyzing bacteria, so they can under predict acid generation. Mineralogy and other factors affecting the potential for acid rock drainage vary from site to site and can result in predictions that greatly differ from what takes place at the mine.

Tailings Impoundments. Tailings impoundments have been used at ore mills in the United States since the early 1900s. In recent years they have become increasingly important in mining and may account for as much as 20% of the cost of a mine or mill project (EPA 1985). Tailings impoundments serve several purposes. They retain water so it can be used in the mill flotation circuits and other processes requiring water. They serve as equalization basins, which help in wastewater treatment process control and reagent addition control. They also protect the quality of surface waters by preventing the release of suspended sediment and dissolved chemicals.

Gold tailings impoundments receive cyanidation process wastes; have high concentrations of cyanide, arsenic, cadmium, lead, mercury, and selenium; and are typically alkaline. The strongest indicators of tailings pond leakage into ground water are the presence of constituents added during beneficiation: chloride and cyanide. Tailings impoundment can leak contaminants into ground and surface waters.

Potential effects of cyanide on water resources are related to cyanide's mobility in water. An EPA study of cyanide showed that some forms are mobile whereas others are less so. Transport mechanisms depend on the type of cyanide and the media through which it travels. High pH and low clay content increase cyanide mobility in ground water systems (EPA 1985).

More than half of all mine tailings are disposed of in tailings impoundments. Use of tailings impoundments is the main method by which tailings are disposed of and wastewater is treated. In addition, settling ponds are typically used at mining and mineral processing operations. Tailings pond size and design vary by industry segment and mine location. Some copper tailings ponds in the Southwest cover 600 to almost 1,000 acres, and one exceeds 4,900 acres (EPA 1985). A Bureau of Mines study in 1981 surveyed 145 tailings ponds in the copper, lead, zinc, gold, silver, and phosphate industries. The average size of these tailings ponds is about 500 acres (EPA 1985).

Possible impacts to water resources from tailings ponds include spills due to failure of the tailing impoundment berm, surface water contamination from runoff, and seepage of leachate into the ground water. Leachates that may percolate downward to ground water, such as by leakage from a tailings impoundment, are not regulated by the Clean Water Act, except as this water may contaminate surface water by emerging at springs and seeps (National Research Council 1979).

Impacts can result from leakage of tailings ponds used in several mining sectors. EPA studied tailings disposal at eight mines for copper, gold, lead, uranium, and phosphate. Ground and surface water monitoring at each site found evidence of some leakage of solute at most sites. But constituents did not reach concentrations high enough to be of concern, no evidence was found that the plumes migrated over long distances (EPA 1985).

Revegetation of tailings is inherently difficult, regardless of the ore mined, because tailings are not amenable to supporting higher plants. Water is an extremely limiting factor in revegetating tailings. Where the precipitation exceeds 20 inches, revegetation problems are simplified. But reclamation in the arid West and at high altitudes or high latitudes requires special techniques and comparatively greater effort (National Research Council 1979).

Physical and Chemical Processing Plants. A variety of physical and chemical processes are used to increase the concentration of valuable metal. The waste material is either deposited in waste rock dumps or tailing impoundments.

Spills. Accidental spills of chemicals used in metal extraction and processing could contaminate surface and ground water.

Leachate. Heap leaching of gold ores is used at many mines to extract minerals from low-grade deposits. For gold and silver heap leach operations, the heap is typically leached with a sodium cyanide solution. Conventional heap leach pads are generally smooth, relatively flat surfaces that are gently sloped in one or two directions to direct the flow of leachate into collection ditches along the pad margins (Buck and Bayer 1989). Heap leach facilities are designed with leak detection features, sometimes using double liners, often a clay liner and a polyvinyl chloride (PVC) liner. Berms are normally built around the facilities to ensure that leachate solutions do not escape into the environment should a heap leach pad fail.

The use of heap leaching processes to extract minerals presents a different set of possible effects to water resources than mining operations. Seepage of leaching chemicals (e.g. cyanide in base metal flotation and in gold extraction, sodium hydroxide and organic flotation compounds) from heap leach pads or from spills can contaminate ground water. In some hydrologic regions affected by mining, the ground water levels are several hundred feet below the surface, and contaminants can greatly weaken before a leak reaches the water table. Many alluvial environments have shallow ground water, and special attention must be paid to monitoring and preventing the contamination of shallow ground water.

A major hydrologic concern in siting heap leach facilities is location in recharge zones. Some leaching facilities, especially those in the Basin and Range Province, are located either in mountainous areas or on alluvial fans along the margins of mountain ranges. These alluvial fans are areas of aquifer recharge (Buck and Bayer 1989). Location of heap leach pads in areas of shallow ground water increases the potential for ground water contamination should a liner leak or the pad itself fail.

Except for system leaks and controlled discharges, spills of cyanide heap leach solutions most often result from the inability of the heap leach system to contain runoff. Interception of precipitation and surface runoff by impoundments containing cyanide decreases cyanide concentrations in the impounded solutions. A leach solution spill could have disastrous to inconsequential impacts. The effects of a spill depend on many factors, including the type of media into which the spill infiltrates, concentration, pH of the solution, ambient air temperature, and volume and chemistry of the receiving waters (Stanton and others 1986).

Cyanide is a highly reactive and relatively short-lived contaminant (Stanton and others 1986). Several processes have been named as potentially significant in the natural degradation or depletion of cyanide in effluents from many gold processing operations. These processes are volatilization, oxidation, biodegradation, photodecomposition, and cyanide-thiocyanate reactions (Stanton and others 1986).

Overall, cyanide can cause three major types of impacts. (1) Cyanide-containing ponds and ditches can present an acute hazard to wildlife and birds. (Tailings ponds present similar hazards, but less frequently, because of lower cyanide concentrations.) (2) Spills of cyanide leaching solutions can enter surface water courses, killing fish and contaminating drinking water sources. Or leaching solutions can enter ground water systems and contaminate water supply wells or discharge contaminated ground water into surface water where streams depend on ground water discharge. (3) Cyanide in active heap leaching facilities, ponds, and mining wastes may reach water sources through leaks from leach pads or percolation and runoff from waste piles (EPA 1997).

In addition to other mining contaminants such as acid drainage and toxic concentrations of metals and some nonmetals, cyanide contamination can significantly harm aquatic life. Cyanide is toxic in its free forms, hydrogen cyanide (HCN), and the cyanide ion (CN-), and as breakdown compounds such as cyanates, thiocyanates, chloroamines, cyanogen chloride, and metal-cyanide complexes. No contaminant level criteria have been established for the cyanide-related compounds (Moran 1998). Although free cyanide does not persist in the natural environment and does not bioaccumulate through the food chain, some of the breakdown complexes do bioaccumulate, and some are especially toxic to fish. Consequently, both short and long-term exposure to excessive concentrations of cyanide and related compounds can kill or impair aquatic life (Moran 1998).

Sediments. The impacts from placer mining and general surface disturbance from exploration and mining include increased organic loading in the stream system from the introduction of overburden sediments or inundation of organic-rich soils. This increase may produce anaerobic conditions in the sediment; decreases in dissolved-oxygen levels in the water; and increases in color, iron, tannin, lignin, organic carbon, nutrients, dissolved solids, and chemical or biological oxygen demand.

Environmental Consequences

Impacts Common to All Alternatives

The Clean Water Act (1977) and the Safe Drinking Water Act (1974, amended in 1986 and 1996) mandate that all states adopt water quality standards, which set forth designated uses of waters within their states and numeric criteria to protect those uses. The Safe Drinking Water Act established drinking water regulations, setting maximum contaminant levels (MCLs), which are primary standards, and maximum contaminant level goals (MGLGs) for specific contaminants. Whereas MCLs are mandatory and enforceable standards, MCLGs are secondary standards and as such are nonenforceable (40 CFR Part 141). The National Primary Drinking Water Standards, set forth in 40 CFR Part 142, establish drinking water standards that all states must either adopt or have their own standards that are at least as stringent. National Secondary Drinking Water Standards are set forth in 40 CFR 143. Mineral operations must meet all water protection standards that have evolved out of these federal laws.

The protection of ground water is mainly a state responsibility. No federal laws deal specifically with ground water although the latest amendments (1996) to the Safe Drinking Water Act address source water protection areas (SWPA) that provide for protecting ground water sources used for drinking water. States are now beginning to implement source water protection programs for areas that supply water for public use. These initiatives may be applied to mining if it is conducted near recharge areas for community water supplies.

Water resource concerns are receiving increased attention from state regulatory agencies. Many states have enacted new environmental protection laws since 1990, and many have provisions related to mining. Examples include Arizona's Aquifer Protection Permit program begun in 1994 and 1995 and the Mined Land Reclamation Act passed in 1994, and Colorado's Mined Land Reclamation Act, which was significantly amended in 1996. The state mining and water laws and regulations are constantly evolving in response to increasing regulatory experience in mining and advancing technology, citizen and legislator concern for environmental issues, and the state anticipation of federal action (McElfish and others 1996).

Federal water protection requirements affect state water resource protection laws. For example, a major piece of legislation in Arizona in 1986 created a broad water resource protection law, which adopted the federal water quality standards as the state standard and provided that other water quality standards might be adopted as deemed necessary (Arizona Dept. of Mines and Mineral Resources 1998).

The state and federal water protection requirements are used to ensure that mineral activities comply with all standards for water protection. Federal regulations to protect water resources apply to the production of federally owned minerals. These statutes either (1) focus on monitoring to ensure detection of contaminants at existing operations or (2) are aimed at providing protection measures such as creating aquifer protection areas for municipal drinking water wells by employing a buffer zone that precludes development. Also, many states have enacted ground water classification programs to help make decisions on development and protection of water supplies. Some of these programs are not specific to mining but require the overall protection of ground water from contamination sources.

Alternative 1: No Action

Water Quality.

Pit Lakes. Under No Action, after mining is completed, pit lakes could form and take decades to reach their full depth upon equilibrium with the regional ground water system. The number of new open pit mines in the foreseeable future would likely continue at the same rate as seen during the past 10 years. Potential impacts to water resources could include the migration of contaminated water from the pit lake into aquifers down gradient of the pit, discharge of contaminated ground water to the surface through springs or seeps, mortality of waterfowl landing on pit lakes if the lake water is toxic (could be either acidic or alkaline), and increased losses of water by evaporation.

Acid Rock Drainage. Water quality could degrade in some areas from development of acid rock drainage from waste rock piles, tailing impoundments, and flow-through leakage from pit lakes. Acid rock drainage would largely be a problem where water quality analysis has not been accurate or mitigation measures have not been successful in preventing it.

Water Quality Not Related to Acid Rock Drainage. Streams would continue to receive some loading of sediments from disturbed areas. Even where best management practices are used sedimentation would not be eliminated. Leachate from waste materials might not be acid rock drainage but might still have high level of metals. This leachate might contaminate soils and water.

Surface Water Diversions. Some surface water courses would be diverted from their natural channels where they pass over or near large mines. Many of these diversions would be temporary during mine operations. Others diversions would be permanent because the stream could not be rerouted to the original channel after establishing a new channel with stream dynamics and vegetation.

Spills. Accidental spills of mineral processing chemicals (cyanide) or catastrophic failure of tailings impoundments or heap leach pads could release toxic chemicals into streams and ground water. Most of these unplanned and undesirable events would be short-term impacts and are usually successfully remediated.

Leakage from Tailings Impoundments and Heap Leach Facilities. Seepage and leachates from tailings impoundments are expected. But because most facilities employ either leak detection or monitoring systems, leaks would be discovered and remediated. Detection could fail, leakage could escape, and some constituents could percolate into the ground water below the impoundment and migrate down gradient to water sources, threatening receptors. Most facilities are monitored for up to 30 years after mine closure

Ground Water Degradation. Polluted ground water might emerge as nonpoint discharges (diffuse springs and seeps) that might not become evident for years after underground mines have closed (after mine filling). Such discharges might be indicators of a widespread contamination plume migrating from the mine.

Water Quantity.

Dewatering. Under No Action, impacts would continue from dewatering. Some springs would be lost. Some streams would dry up. Lowered water levels could require some farms to deepen irrigation wells. Ground water levels would take years, perhaps decades, to fully recover from dewatering at the largest mines, and some water levels might never fully recover to premining levels.

Discharge of Pumpage. Pumpage from dewatering could be discharged into existing stream channels. New riparian areas might be created temporarily during dewatering, resulting in altered channel morphology. Some aquifers could contain waters naturally high in some constituents such as arsenic. Discharge of waters containing elevated levels of such constituents could migrate down channel into existing waters that meet standards and lower the quality of the receiving waters.

Cumulative Impacts. Under No Action, cumulative impacts to water resources would result from new open pit mines being developed near existing mines. Such a situation is emerging in northern Nevada, where several open pit gold mines are being developed and new mines are in the EIS or planning phase. Other cumulative impacts could result in areas already affected by past mining. New mines in these areas could further degrade water quality of surface streams. On the other hand, new mineral activity in historically degraded areas could actually improve water quality.

Alternative 2: State Management

States are increasingly using water quality-based effluent limits to set their permitting regulations. Some states require specific design or performance standards, especially for such things as construction standards and liners for tailings impoundments and heap leach pads.

Under State Management, water resources would little change from conditions under the existing regulations. Mining would have to comply with an evolving set of state standards and regulations that could become more restrictive if states adopt prescriptive standards. Due to the expected slight increase in mineral activity (up to 5% across the study area), potential impacts to water resources would slightly increase.

Alternative 3: Proposed Action

The Proposed Action would not change the existing framework of federal and state laws that protect water resources. It would, however, increase protective measures for water resources and reduce the risk of water resource contamination by implementing tighter controls on capturing and treating acid rock drainage, managing potentially acid-forming materials (source controls), drilling and grouting exploration holes, collecting baseline data before operation startup, designing leach operations, monitoring water resources, and backfilling pits. These measures would ensure that water resources would be protected to regulatory standards. Periodically, operations would deviate from the standards and would require time to comply with them.

Predicting water quality impacts at mining sites is difficult and involves much uncertainty. Mitigation measures are designed around the uncertainty inherent in predicting water-rock interactions and implementing environmental controls. These measures would continue to protect water resources.

Water Quality.

Surface Water. The Proposed Action would probably reduce the extent of impacts to water resources from mining. The strengthened provisions for water quality protection would help reduce the potential for water quality degradation. Contamination to surface water courses could decline.

Pit Lakes. Mine pit lakes could affect surface and ground water resources. Impacts from pit lakes would be slightly reduced by the backfilling of open pit mines. This provision would analyze backfilling and could reduce the number and the size of pit lakes and their impacts on water quality.

Ground Water. Overall, ground water would be better protected under the Proposed Action than under No Action. The effect of backfilling on ground water quality would be highly variable, depending on the type of deposit mined and the effectiveness of segregating the backfill material to prevent onset of acid generation if this material includes acid-forming waste rock. Overall, the backfilling requirement would be used to reduce impacts to ground water.

The Proposed Action includes requirements to plug all exploration holes to prevent the mixing of water from different aquifers and to prevent movement of water downward into mine workings. These requirements would likely benefit ground water.

Water Quantity.

Dewatering. Under the Proposed Action impacts would continue from dewatering. Some springs would be lost. Some streams would dry up. Lowered water levels could require some farms to deepen irrigation wells. Ground water levels would take years, perhaps decades, to fully recover from dewatering at the largest mines. Some water levels might never fully recover to premining levels.

Discharge of Pumpage. Pumpage from dewatering could be discharged into existing stream channels. Dewatering might create new riparian areas, resulting in altered channel morphology. Some aquifers could contain waters naturally high in some constituents such as arsenic. Discharge of waters containing elevated levels of such constituents could migrate down channel into existing waters that meet standards and lower the quality of receiving waters.

Cumulative Impacts. Cumulative water resource impacts of mining would continue to be experienced where several mining projects are permitted. The most notable impact would be the effect of coalescing cones of depression from dewatering open pit mines that are close to each other. These effects could extend for a radius of several miles. The discharge of pumpage from dewatering several mines could become a serious water management problem that could be compounded by water quality concerns of the discharged water.

Alternative 4: Maximum Protection

Alternative 4 would offer the greatest potential for protecting water quality. The decrease in mineral activity, the stringent standards, and the unsuitability requirements would all reduce potential adverse impacts to water resources. The requirement of designing all facilities to meet the probable maximum precipitation event would decrease the amount of erosion and sediment from the facility and contain any potential spill or unplanned events.

Water Quality.

Pit Lakes. Requirements for pit backfilling would result in improved water quality at some mines.

Acid Rock Drainage. Acid rock drainage evaluation and control measures would strengthen protection for water resources. Restricting operations to no more than 20 years of water treatment would result in applying source control measures to minimize water contamination. As a result, any treatment facilities that might be required as a last resort under this alternative could be smaller scale plants.

Water Quantity. The requirement for operators to restore the hydrologic balance within 20 years would prevent long-term impacts to water resources.

Soils

Affected Environment

The National Research Council (1981) defines soil as a discrete, definable, dynamic complex of organic, inorganic, biologic, and geologic materials. Soil forms slowly, beginning with the accumulation of unproductive materials and increasing in productivity as the natural processes of weathering, biological activity, and leaching take place. Soil's ability to support life depends on its capacity to absorb, store, and transfer energy and water.

Brady (1974) outlined five major soil forming processes as (1) climate, (2) living organisms, (3) parent material, (4) topography, and (5) time. As the soil weathers, a soil profile forms. A profile consists of layers or horizontal units called horizons. These soil horizons can be grouped into four general zones: the O, A, B, and C groups (Brady 1974). The O group consists of organic-rich horizons formed above mineral soil, resulting from litter derived from dead plants and animals. The A horizon consists of mineral horizons that lie at or near the surface and are characterized as zones of maximum leaching or eluviation. The B group, sometimes referred to as the subsoil, consists of horizons in which illuviation from above contributes to an accumulation of such materials as iron and aluminum oxides and silicate clays, or in arid regions, accumulations of calcium carbonates or calcium sulfate. The C horizon consists of the unconsolidated material underlying the A and B horizons and may or may not be the same as the parent from which the A and B horizons formed. The C horizon usually lies outside the zones of major biological activity and is little affected by soil-forming processes.

A soil profile is characterized by the sequence and development of the horizons described above. These horizons normally can be distinguished from one another by their texture, color, structure, and organic matter content. Under the Comprehensive Soil Survey System, the soil profile can be classified into one of ten broad classifications called soil orders (Brady 1974). Within the EIS study area are 10 major soil orders: Andisols, Aridisols, Entisols, Inceptisols, Mollisols, Ultisols, Alfisols, Vertisols, Histosols, and Spodosols.

- Andisols formed under the strong influence of volcanic ash. They are often erosive and found mostly in forested areas.
- Aridisols developed in dry regions and are usually light colored and low in organic matter. They may have accumulations of sodium, soluble salts, and lime. Desert shrubs, sagebrush, and pinyon-juniper plant communities commonly grow on Aridisols.
- Entisols are relatively young soils formed in recently deposited materials. They therefore have little soil profile development.
- Inceptisols are also young soils that have undergone more weathering and soil forming processes than Entisols. Inceptisols are common in coniferous and deciduous forests.
- Mollisols have a thick, dark colored surface horizon rich in organic matter and are most abundant in prairie grasslands.
- Ultisols occur on stable surfaces that have undergone advanced soil development resulting in the accumulation of a clay-rich subsurface horizon. Ultisols are usually found in forests.
- Alfisols also exhibit clay accumulation within

the soil profile and are most common in coniferous and deciduous forests at higher elevations and in mountain shrub communities.

- Histosols contain at least 50% organic matter in the upper 32 inches of their profile and occur within riparian areas, seeps, and bogs.
- Spodosols are mineral soils with a subsurface horizon having an accumulation of organic matter. Spodosols are common along coastal areas of Alaska and support Sitka spruce and western hemlock.

Since the inception of the 3809 regulations in 1981, about 214,000 acres of public lands, including the soils on them, have been disturbed by exploration and mining. Except for placer mining, most of this disturbance has taken place within the western contiguous states, occurring predominantly on Aridisols and Mollisols. The bulk of placer mining on public lands has occurred in stream channels in Alaska, disturbing mainly Entisols.

Of the 214,000 acres disturbed by mining under the 3809 regulations, 65,000 acres have been reclaimed. Reclamation in the early 1980s consisted mainly of grading to less steeper slopes followed occasionally by seeding. Attempts at salvaging topsoil were inconsistent. Disturbed areas were often revegetated directly on the regraded surfaces of waste rock, tailings, or heap leach material. Through the mid-1980s, as larger mines were proposed, it became a more common practice to conduct soil surveys and salvage the soil surface —the O and the A horizons—commonly known as topsoil, for later use on the reconstructed surfaces.

On average, between 6 inches and 2 feet of topsoil are typically salvaged except where bedrock is close to the surface or surface accumulations of salts or sodium inhibit plant growth. Where topsoil is lacking or unsuitable, reclamation is still undertaken directly on the reconstructed surfaces. Soil amendments such as, mulch and fertilizer may be used to minimize erosion and improve the fertility of the reconstructed surfaces for vegetation. Issues involving postmining physical and chemical characteristics of the soils on a particular site are generally addressed in the reclamation plan.

For placer mining, the surface layer of soil, where it exists in enough quantity, is usually stripped and used later for reclamation. But the bulk of placer mining on public lands has taken place within Alaska, and many of these areas have been already mined in the past. Soils that may have been there have since been mined through and lost. Larger placer mines are usually reclaimed by regrading tailings and coarse rock stockpiles to re-create the channel and flood plain. Vegetation is then allowed to become established by natural succession. Placer mining usually occurs within the confines of a drainage system. Over time, especially during high flows, the drainage would rework the loose material and establish a new floodplain.

As the reclamation program for the 3809 regulations has evolved, many western states also began to institute mine reclamation programs of their own, on private as well as the public lands. (See Appendix D for a summary of each state's mine reclamation program.) Many of these state reclamation programs were developed at about the same time as the existing 3809 regulations, and they often mirrored and reemphasized BLM's reclamation programs.

Environmental Consequences

Impacts Common to All Alternatives

Mining typically follows a logical sequence, starting with exploration and proceeding to extraction when economic deposits are found. Impacts of this sequence on soils range from dispersed and negligible during early exploration to more local and intense as mineralization and ore deposits are defined and ore is mined. With mining, disturbance is nearly total as the soil profile is destroyed either by excavation or burial. The National Research Council (1981) summarized the effects of soil disturbance by mining as generally more adverse than advantageous because many beneficial soil characteristics require hundreds to tens of thousands of years to reach steady state. Disturbance, however, may actually increase a soil's productivity where mining breaks up a restrictive hardpan or where replacement of sodium or salt-affected soils results in greater plant growth (National Research Council 1981; Schafer 1984). Because only the topsoil is usually salvaged and stockpiled for later reclamation, the loss of the rest of the soil profile is almost always irreversible, including whatever forces these deeper horizons played in favoring the growth of one plant over another or one plant community over another.

Reclamation of mine disturbances, either concurrent with mining or after closure, customarily involves grading slopes to less steep angles, applying topsoil, and revegetating. Except for open pit mining, most mining disturbances can be reclaimed to vegetation that is adapted to the reconstructed surface and new soil regime. Most often, however, the newly reconstructed soil would resemble a younger soil, such as an Entisol, with little soil profile development.

Typical of open pit mining, several years or more may pass before reconstructed areas are ready to be reclaimed. Topsoil that is salvaged is often stored in large piles, tens of feet or more thick. Due to the lack of oxygen, soils buried under a few feet begin to lose the microfauna and flora that are important in nutrient cycling. At the same time, seeds stored in the buried topsoil would also begin to lose their viability, and the benefits of the soil as a native seed bank are diminished.

Alternative 1: No Action

Under the existing 3809 regulations topsoil is salvaged and stockpiled for reclamation use later. Upon final reclamation, slopes are usually graded to blend with the surrounding topography, topsoil is reapplied, and new surfaces are seeded. The main emphasis of this reclamation has been on promoting the establishment of a productive cover of perennial plants roughly equal in cover to what exists next to the mine disturbance. To this end, mine reclamation has been fairly successful (Ross 1996). In Alaska, vegetative cover is generally allowed to come back naturally following grading and reapplying topsoil.

The exceptions to the salvaging of topsoil are where (1) the soil has been lost due to past mining, (2) little soil exists to strip because of thinness to bedrock or a hardpan, or (3) the surface has chemical or physical properties that inhibit plant growth. In these latter cases, materials (waste rock, tailings, or heap leach material) left on the surface after regrading are reclaimed. Problems may occur, however, where the reconstructed surfaces, consisting of waste rock, tailings, or heap leach material, are also harmful or not suitable to plant growth for physical and chemical reasons. Soil amendments such as mulch and fertilizer may be added to improve the fertility of the new surface. But the new soil might not be able to support the same plants or diversity of plants as before.

Alternative 2: State Management

Except for small disturbances, all the states in the study area have some form of program in place for reclaiming mining disturbance. For activities involving less than 3 to 5 acres of surface disturbance, states like Arizona, Alaska, Montana, Nevada, and Washington do not require operators to notify state authorities of surface-disturbing activities or reclamation. The state mine reclamation programs therefore tend to emphasize larger mines. State requirements for salvaging and reapplying topsoil upon final reclamation are similar to BLM's existing 3809 regulations.

State agencies are usually staffed at much lower levels and may lack their federal counterpart's resources. State agencies are also usually located in one central place in contrast to BLM, which has field offices spread throughout the state near the mining activities and public lands they manage. Besides having geologists who administer the 3809 regulations, BLM offices also have reclamation specialists and soil scientists whose expertise would ensure that soil resources are recognized and salvaged for final reclamation.

The nature and extent of the impacts on soils and reclamation under Alternative 2 would be similar to those expected under the existing regulations, management practices, and policies. Compliance with requirements in most states would likely continue at current levels once state programs have had an opportunity to staff up to address the increased workload.

Alternative 3: Proposed Action

The Proposed Action addresses the use of replacement soil when the topsoil or growth media are of poor quality. Soil surveys are usually conducted before mining to determine the soil's capability and limitations and the depth and volume of topsoil suitable for salvaging. Typically, only the surface horizons or topsoil is salvaged and stockpiled for reclamation use. In most cases the topsoil provides a more desirable plant growth medium than the subsoils, overburden, or mine spoils. Topsoil usually has a better structure and texture and contains the biological components needed for nutrient cycling (Chambers 1989).

Exceptions to the above occur where the topsoil itself is harmful or not suitable to plant growth because of accumulations of salt or sodium. Or topsoil may be limited because of shallow depth to bedrock or a hardpan. In these cases segregating from the overburden or waste rock a growth medium that has good characteristics for plant growth would help establish vegetation upon final reclamation. Good characteristics for replacement growth media include a loam texture, a general lack of rocks, and chemical neutrality. Replacement soils or growth media are being used in some areas. Making their use mandatory would institutionalize the practice and lead to better success in revegetating mine disturbances where the native soil is limited or limiting to plants.

The Proposed Action emphasizes minimizing erosion through grading of reclaimed slopes to gentler contours followed by revegetating to hold the soil in place. Mining can lead to accelerated soil erosion, where the surface is disturbed and vegetation has been disturbed or removed. Erosion commonly removes the surface, which is usually the most fertile part of the soil. As a result of grading slopes to gentler contours, less soil erosion overall would be expected.

Alternative 4: Maximum Protection

Alternative 4 would require that subsurface horizons as well as the soil surface be salvaged and stockpiled and would result in conserving more soil. Especially where soil formation and profile development allow the growth of certain plants, the requirement to salvage more of the soil profile and return it to the reconstructed surface in roughly its original vertical order should enhance the ability to restore a site to the same plant community or to native plants that grew there before mining. But the benefits of these practices have limits. In stripping, stockpiling, and reapplying topsoil and subsoils, horizons would be mixed and homogenized. Some of the beneficial soil characteristics such as soil structure would be lost in the process.

Under Alternative 4, all mining and exploration that is not casual use would require a Plan of Operations. The result would be a more formal review of activities previously covered by a Notice and not subject to BLM approval. The more formal review and permitting process would tend to ensure that soil resources are surveyed, salvaged, and conserved for reclamation. In addition, greater environmental controls, such as increased testing for acid-generating potential, would reduce the incidence of soil contamination.

Alternative 4 would also require operators to hire third-party contractors to monitor operations, resulting overall in a greater on-the-ground presence of workers responsible for ensuring that the soil is salvaged and stockpiled according to the reclamation plan.

Erosion control would be enhanced by the requirement to final grade at slopes of 3 to 1 (horizontal to vertical). This requirement would reduce soil loss from erosion.

Vegetation

Affected Environment

The pattern of vegetation in North America has fluctuated widely in the past 10,000 to 12,000 years, following the melting of the continental glaciers. During the postglacial period the climate was notably warmer and drier than today. The boundaries of the forests and shrub-like grasslands have fluctuated accordingly (Mehringer and Wigand 1987), as have the boundaries of other drier-site plant communities. Still, the types of plant communities that will grow on a site are dictated most often by the site's soil type, its topographic position, and the area's climate. Plant community types within the EIS study area can be divided into the following broad groups: Sagebrush, Desert Shrub, Southwest Shrubsteppe, Chaparral-Mountain Shrub, Pinyon-Juniper, Mountain and Plateau Grasslands, Plains Grasslands, Annual Grasslands, Alpine, Coniferous and Deciduous Forests, Riparian, Coastal Forests, Boreal Forests, Lowland Tundra, and Upland Tundra. For a more complete description of most of these plant community types see the *Rangeland Reform '94 Draft EIS* (BLM 1994a).

Sagebrush

Within the upper and lower basin and range provinces, the Colorado Plateau, the Columbia Plateau, and the Wyoming basins, sagebrush often dominates dry slopes and lava bed flats, ancient lakebeds, and broad alluvial basins. Most of the sagebrush zone is found at elevations from 2,000 to 7,000 feet. Where sagebrush dominates below 7,000 feet, annual precipitation varies between 8 and 20 inches (Wright and others 1979).

Important shrubs include big sagebrush, black sagebrush, low sagebrush, rabbitbrush, Mormon tea, curly leaf mountain mahogany, bitterbrush, snowberry, and horsebrush. Important perennial grasses include Sandberg bluegrass, blue bunch wheatgrass, western wheatgrass, Idaho fescue, Great Basin wildrye, junegrass, Indian ricegrass, squirreltail, muttongrass, and needle-and-thread grass. Red brome, medusahead, and cheatgrass are introduced annual grasses that have become abundant. Common forbs include wild onion, sego lily, balsam root, mulesear, Indian paintbrush, larkspur, tarweed, rubberweed, lupine, phlox, locoweed, and annual mustards (Cronquist and others 1972).

Desert Shrub

Desert shrub communities occupy the hot and cold deserts of Arizona, Nevada, Utah, and California. These deserts are dominated by shrubs in open stands, with large amounts of bare soil or desert pavement exposed. Understory vegetation is often sparse at lower elevations except when flushes of annuals are produced by seasonal precipitation in the Mojave and Sonoran deserts.

Desert plants have adapted to harsh growing conditions, which include root systems of some shrubs that can access deep soil moisture, as well as, shallow roots that extend laterally some distance and compete with herbaceous vegetation for surface moisture. Plants such as cacti and other succulents have special tissue in their stems or leaves to store moisture and limit moisture losses by minimizing transpiration. Annuals germinate, mature, and produce seeds only during favorable temperatures and moisture conditions, often within a single season. Desert plants have also adapted to drought caused by high soil salinity or alkalinity by removing excess salts from their tissues and regulating salt uptake from their roots.

Southwest Shrubsteppe

The southwest shrubsteppe vegetation zone occupies the semidesert grasslands of southeast Arizona, southern New Mexico and the northern Chihuahuan Desert. Elevations of the semidesert grasslands range from 3,300 to 5,000 feet (Brown 1985). More than half of the 10 to 20 inches of annual precipitation falls during the summer growing season (Benson and Darrow 1981). Semidesert grasslands are best developed on deep, well-drained soils at level sites on the higher plains. Their aspect is a grassy landscape broken up by large, well-spaced shrubs. In the

Southwest, semiarid grasslands often form an alternating landscape mosaic with Chihuahuan desertscrub.

Large acreage of this grassland are now dominated by mesquite, tarbush, acacia, and creosotebush. Black grama and tobosa are the most characteristic grasses. Other important grasses on the better sites include sideoats grama, hairy grama, bush muhly, vine mesquite, Arizona cottontop, slim tridens, pappus grass, tanglehead, threeawns and curly mesquite. Other shrubs and succulents characteristic of this grassland include yuccas, bear grass, sotol, agaves, allthorn, sumac, hackberry, ocotillo, acacias, and mimosas. Many variations of cacti grow in the drier sites, especially on outcrops.

Chaparral-Mountain Shrub

The chaparral-mountain shrub vegetation type occupies foothills, mountain slopes, and canyon habitats ranging from southern Oregon to the Mexican border, and from sea level to more than 5,000 feet. Chaparral-mountain shrub communities typically consist of dense to moderately opens stands of evergreen shrubs that grow to roughly uniform height. Most chaparral shrubs are deep rooted, sprout readily from the root crown, and regenerate quickly after burning (Brown 1982).

Canyon live oak is a common dominant of the interior chaparral. Associated shrubs include manzanita; mountain mahogany; yellowleaf silktassel; sumac; hollyleaf buckthorn; chamise; red shank; and several sophora, ceanothus, and other oak species. Important grasses include sideoats and hairy grama, cane bluestem, plains lovegrass, threeawns, and wolftail. These grasses are largely confined to recently burned areas and rocky, protected sites. Forbs are not particularly abundant except during brief periods after burns (Brown 1982).

Pinyon-Juniper

The Pinyon Pine and Juniper vegetation type grows at mid-elevations on mountain slopes within and next to the Great Basin. This is a cold-adapted evergreen woodland with the unequal dominance of two conifers, junipers and pinyon pine. The pinyon-juniper woodland reaches its greatest development on mesas, plateaus, slopes, and ridges from 3,200 to 8,400 feet (Blackburn and Tueller 1970; Evans 1988). Precipitation ranges from 10 to 25 inches annually (Blackburn and Tueller 1970). Pinyon-juniper communities survive on a wide variety of soils, ranging from shallow to moderately deep and from coarse and rocky to fine compacted clays.

Rocky Mountain juniper, Utah juniper, and oneseed juniper often grow together (Cronquist and others 1972). In the dry mountains of souther New Mexico and below the Mogollon Rim in Arizona, Rocky Mountain juniper, Utah juniper and doubleleaf juniper disappear, and alligator juniper (a sprouting variation of juniper), Emory oak, gray oak, and Mexican pinyon appear (Brown 1982). The associated understory of shrubs, grasses, and forbs in juniper communities commonly consists of a variety of vegetation from sites near woodland communities.

Mountain and Plateau Grasslands

The mountain and plateau grasslands are located at moderate to high elevations (3,000 to more than 9,000 feet) in the West. These grasslands often occur within a vegetation mosaic created by the complex environment of the Rocky Mountains. The grasslands ecosystem receives from 8 to 30 inches of precipitation annually (Garrison and others 1977; Mueggler and Stewart 1980), at least half of it usually falling during the growing season. The topography of mountain and plateau grasslands ranges from level areas or valley floors to alluvial benches and foothills or steep mountain slopes.

Important grasses in mountain and plateau grasslands include grama grasses, bromes, bluegrasses, oatgrasses, sedges, wheatgrasses, fescues, needlegrasses, and Junegrass. Diverse throughout the region, the forb component varies with the site, latitude, and management. Shrubs include fringed sagebrush, rabbitbrushes, snakeweed, shrubby cinquefoils, wild roses, and horsebrush (Mueggler and Stewart 1980).

Plains Grasslands

The plains grasslands vegetation type is found in the Great Plains, stretching from eastern Montana, North Dakota, and Western Minnesota southward to eastern New Mexico and Texas. The western half of the plains grassland forms a broad, flat belt of land sloping gradually eastward from the foothills of the Rocky Mountains. Mixed and shortgrass communities are most commonly found on federal lands within this vegetation type.

The short grasslands communities stretch from southeast New Mexico through eastern Colorado to southeast Wyoming. Annual precipitation ranges from 11 to 20 inches, and elevations range from 6,000 feet on the western edge to 3,000 feet on the southern edge. Dominant grasses are buffalograss and blue grama, with smaller amounts of threeawns, lovegrass, tridens, sand dropseed, sideoats grama, tobosa, galleta, vine mesquite, and bush muhly. Forbs are seldom a major component, except during wet years. Dominant woody plants include honey mesquite, shinnery oak, sand sagebrush, snakeweed, yucca, fourwing saltbush, cholla, and prickly pear.

The mixed grass communities stretch from northeast Wyoming through North and South Dakota and eastern Montana. Precipitation varies from 20 to 28 inches, increasing from west to east. Elevation ranges from about 3,000 feet at the western edge to 900 feet in Texas (Wright and Bailey 1980). Sedges and cool-season grasses, such as needlegrasses, wheatgrasses, and fescues, dominate the communities of Montana and North and South Dakota. Warm-season grasses, particularly blue grama, also grow in mixed grass communities and increase in dominance to the south.

Other important grasses in mixed grass communities include green needlegrass, prairie sandreed, needle-and-thread grass, junegrass, sand dropseed, buffalograss, sideoats grama, threeawns, silver beardgrass, sand bluestem, little bluestem, plains lovegrass, and vine mesquite (Brown 1982). Shrubs found in mixed grass communities include juniper, sand sagebrush, silver buffaloberry, sumac, wild rose, and rabbitbrushes, yucca, snakeweed, cholla, and winterfat (Brown 1982; Mueggler and Stewart 1980). Forbs may be an important component of mixed grass communities. Common plants include goldeneye, groundsel, sunflowers, primrose, globemallow, asters, scurf pea, coneflower, and bricklebush (Brown 1982).

Annual Grasslands

Annual grasslands occur in California, especially, on small plains and gently rolling hills scattered throughout southern California, the Central Valley, and in the coastal mountains as far north as Humboldt County. Annual grasslands grow at elevations ranging from sea level to 4,000 feet. Relicts of the pristine California prairies are found within small parcels of annual grasslands.

Fall rains cause the germination of the annual grassland plants that grow slowly during winter, then grow rapidly in the spring as temperatures rise. Dominating annual grasslands are such introduced annual grasses as wild oats, soft chess, ripgut brome, red brome, wild barley, and foxtail fescue. Common forbs include redstem filaree, broadstem filaree, turkey mullen, true clovers, and burr clover. Perennial grasses that are found in moist, lightly grazed or relict areas include Idaho fescue and purple needlegrass.

Alpine Grasslands

Beginning at the upper limits of tree growth, alpine plant communities extend upward to the exposed rocks of mountain tops. Alpine communities have similar combinations of vegetation throughout, including, phlox, clovers, alpine avens, yarrow, alpine sedge, alpine bluegrass, elk sedge, spikerush, and tufted hairgrass. The willow communities typically consist of alpine willow, barren ground willow. Tealeaf willow, and snow willow. Alpine meadow communities grow on sheltered benches, slopes, and level areas where soils are well developed. Alpine marshes replace ponds or develop wherever springs and melting snowbanks contribute to a continuously moist habitat.

Coniferous and Deciduous Forests

Coniferous and deciduous forests grow in the Rocky Mountains; the Sierra Nevada; the Cascade Range; and the mountains of the upper and lower basin and range provinces, the Colorado Plateau, and the Columbia Plateau. Species dominance varies by altitude, latitude, slope, aspect or other topographical position, soil characteristics, and climate regime. Important forest communities of the western rangelands include ponderosa pine, Douglas-fir, aspen, lodgepole pine, hemlock-spruce, cedar-hemlock, spruce-fir, redwood, and western hardwood.

Ponderosa pine is the largest western forest and old-growth ponderosa forests are often park-like, having old trees interspersed within groups of young trees and a well-developed herbaceous understory. Douglas-fir communities are found from the northern portion of the California Coast Range, through Oregon and Washington, and throughout the Rocky Mountains, generally between the ponderosa pine and spruce-fir communities (Wright and Bailey 1982).

Cedar-hemlock forests grow in northern Idaho and northwest Montana, where the westerly winds carry oceanic influence as far inland as the Continental Divide. Douglas-fir and western white pine are common associates. Understory in this zone consists of a rich growth of shrubs and herbs (Wright and Bailey 1982).

Hemlock-spruce communities extend south from British Columbia along the Washington and Oregon coasts and a portion of the Cascade Mountains in Washington. Elevations range from 200 to 4,000 feet. The dominant species are Sitka spruce and western hemlock. Western red cedar, Douglas-fir, and grand fir may also be present to a lesser degree. Common understory plants include vine maple, red whortleberry, Cascades mohonia, twin flower, California dewberry, coast rhododendron, holly fern, and cutleaf fern. The dense overstory reduces production.

Lodgepole pine grows mainly in the central and northern Rocky Mountain of Colorado, Wyoming, Montana, Utah, Idaho, and Oregon. It is also found in the higher mountains of southern California. Lodgepole pine tends to dominate its communities, often forming dense, pure stands with little understory. The understory can vary from being virtually absent to a rich herbaceous layer next to meadow edges. Often invading riparian habitats, lodgepole pine can have a substantial understory of bitterbrush, Idaho fescue, needlegrass, oatgrass, and wildryes.

The spruce-fir community has open to dense evergreen forests and patches of shrubby undergrowth with scattered herbs. Composition of the overstory varies widely but is usually dominated by some combination of red fir, Engelmann spruce, subalpine fir, mountain hemlock, white bark pine, western white pine, lodgepole pine, foxtail pine, limber pine, and bristlecone pine.

The redwood community is a composite name for a variety of mixed conifers that grow within the coastal influence: Sitka spruce, grand fir, redwood, Douglas-fir, and red alder. The redwood community is restricted to the coastal areas of California and southern Oregon.

Western hardwood communities, sometimes called oak woodlands, grow in California and the western interior valleys of Oregon, especially the foothills surrounding the Central Valley and coastal rangelands in California and the Willamette, Umpqua, and Rogue River valleys in Oregon. Trees in these communities include Oregon white oak, Coulter pine, digger pine, coast live oak, blue oak, valley oak, and interior live oak.

Coastal Forests

Coastal forests occupy the south and southeast coasts of Alaska and are dominated by closed and open evergreen forests, mainly Sitka spruce-western hemlock. Closed and open deciduous forest are rare and limited mainly to stands of black cottonwood or red alder on floodplains, streamsides, and recently disturbed sites. Woodland lodgepole pine communities grade into bog types on poorly drained sites. On coastal deltas extensive areas of sedge and grass wet meadows are common (Viereck and others 1992).

Boreal Forests

Occupying vast areas of interior Alaska, boreal forests are dominated by closed, open, and woodland evergreen forest of black and white spruce, but have extensive areas of open and closed deciduous forest of paper birch, aspen, and balsam poplar. Within this vegetation zone are extensive mosaics of shrub and herbaceous types, including extensive areas of subarctic lowland sedge and sedge-moss bog meadows as well as willow, sweetgale, and graminoid bogs (Viereck and others 1992).

Lowland Tundra

The dominant vegetation of the lowland tundra consists of wet sedge meadow interspersed with many lakes. The lowland tundra occurs mainly on the coastal plain of northern Alaska and in the low lying deltas and other coastal areas in western Alaska (Viereck and others 1992).

Upland Tundra

Over much of arctic and western Alaska the upland tundra is dominated by *Eriophorum vaginatum* tundra with areas of *Dryas* dwarf shrub tundra on exposed ridges and dry rocky sites. In mountainous areas above treeline, *Dryas* dwarf and ericaceous shrub tundra are the most widespread plant communities. In many areas in western Alaska and in most areas near treeline in the Alaska and Brooks ranges, the zone includes extensive areas of shrubland, mainly low shrub dwarf birch. On the Aleutian Islands, the most widespread community is *Empetrum* heath, but extensive areas of dry and mesic graminoid herbaceous vegetation also occurs (Viereck and others 1992).

Threatened, Endangered, and Candidate Species

The Endangered Species Act of 1973 was passed to conserve threatened and endangered species and the ecosystems on which they depend (see Appendix C). Under the act, species are classed as threatened, endangered, proposed, or candidate species. Endangered plant species are listed because they are in danger of extinction throughout all or a significant portion of their range. Threatened species are those likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Proposed species are those for which a proposed rule to list as endangered or threatened has been published in the *Federal Register*. Candidate plant species are on file with the U.S. Fish and Wildlife Service as vulnerable but where further action is precluded by higher priority listing. To date, about 369 plants are listed as federally endangered, threatened, proposed or candidate species on BLM administered lands (see Appendix F).

Impacts of Mining

Since the inception of the 3809 regulations in 1981, about 214,000 acres of public lands and the vegetation on them have been disturbed by mineral exploration and mining. Except for placer mining, much of this land has been disturbed within the western contiguous states, mostly in the plant community types described previously as sagebrush, mountain grasslands, pinyon-juniper, prairie grasslands, and southwestern shrubsteppe. Placer mining on public lands has occurred predominantly within stream channels in Alaska, disturbing mainly riparian vegetation, which is discussed in the Riparian-Wetland Resources section of this EIS. Many of the plant communities disturbed by mining under the existing regulations were within historic mining districts that had themselves been affected by past mining in addition to other activities such as livestock grazing and range seedings. As a result of these past disturbances many areas have been invaded by weeds

Of the estimated 214,000 acres disturbed under the 3809 regulations, 65,000 acres have been reclaimed. Reclamation under the 3809 regulations has evolved since 1981 as the experience and knowledge of both mine and agency people have grown. In addition, many western states have developed mine reclamation programs in coordination with BLM. In the early 1980s reclamation consisted of limited grading followed occasionally by seeding. Disturbed areas were often revegetated directly on regraded surfaces of waste rock, tailings, or heap leach material. Beginning in the mid-1980s seeding areas became more common. Now it is standard practice to salvage topsoil and seed disturbed areas during reclamation.

Early seedings were conducted with grasses developed predominantly for livestock grazing. Many grasses were seeded because of their drought tolerance and success in establishing under a variety of circumstances. Grasses such as *Agropyron cristatum*, crested wheatgrass, were often used because seed was available and it successfully stabilized disturbed areas. At present, re- vegetation typically uses a diverse mixture of grasses, forbs, and shrubs, and these seedings increasingly consist mostly or entirely of native species.

Over the last several years BLM has incorporated more rigorous requirements for monitoring revegetation success, as in Nevada where the perennial plant cover of reclaimed areas is compared to adjacent, undisturbed reference areas. Ross (1996) evaluated the reclamation success of mine disturbances on public lands in Nevada and found that in most cases total perennial plant cover of reclaimed areas equaled and often exceeded cover of adjacent, undisturbed reference areas.

Environmental Consequences

Impacts Common to All Alternatives

Most mine disturbance has and is expected to continue to take place on public lands within Nevada, Montana, California, Arizona, Idaho, Utah, and Alaska, and would affect the sagebrush, desert shrub, pinyon-juniper, and southwest shrubsteppe plant communities. Little mining has or is expected to occur on public lands within coniferous and deciduous forests

Except for open pits; and arctic, alpine, and desert environments, which are among the most fragile and slowest to recover from disturbance, most mining disturbances can be reclaimed to vegetation that is adapted to the reconstructed surface and new soil regime. Upon final reclamation, the classic view of ecological succession holds that a series of plant assemblages will progressively occupy a site following a disturbance. Each plant assemblage is then replaced by a successor until the final climax community is reestablished. Where the goal has been to restore the predisturbance ecosystem, a typical management strategy is to hasten the rate of succession by planting late seral species in the hope that the vegetation will continue quickly toward the premining plant community. The plant community that does establish on the reconstructed surface may well approximate the plants that grew there before, but chances are the site will greatly differ from premining conditions, and a different plant community or potential will become established.

Drastic disturbances such as mining may yield substrates that dramatically differ from those before disturbance, and such differences may affect the rate of succession, chronically altering its direction (Schafer 1984). Different trajectories of succession are therefore possible because of different initial conditions relative to premining conditions following reconstruction and reclamation (Allen 1988). For example, in Nevada shallow-rooted low sagebrush (*Artemisia arbuscula*), which grows on sites because of shallow soils to bedrock or hardpan, would give way to big sagebrush (*Artemisia tridentata*), where the reconstructed surface now consists of topsoil over a reclaimed waste rock dump. (See the previous discussion on soils.)

BLM must consult with the Fish and Wildlife Service when any mining activity it authorizes might affect a listed species or its designated critical habitat, or is likely to jeopardize proposed species or adversely modify its proposed critical habitat. The effects of mining are weighed against biological and environmental considerations specific to these species. If the net effect is so damaging to the species that the action is likely to jeopardize its existence in the wild or adversely modify critical habitat designated for it, the Fish and Wildlife Services renders a "jeopardy" or "adverse modification" opinion. The Fish and Wildlife Service and BLM then seek alternatives or project modifications that relieve such jeopardy or adverse modification.

Alternative 1: No Action

Under No Action, disturbance from mining and exploration is expected to continue at about the same rate as has occurred since 1981, about 12,500 acres per year. Revegetation of mine disturbances is expected to evolve toward a greater use of native species with a more equal establishment of forbs, shrubs, and trees relative to grasses. A main goal of revegetation will still be to emphasize the stabilization of surfaces from the effects of erosion by establishing a productive cover of perennial plants. A second objective will be to establish a plant community that meets the postmining land use goal, which in most cases will not completely match premining plant communities. For many mine disturbances the site's potential would be changed or shifted to plants adapted to the new soil regime.

Alternative 2: State Management

Except for small disturbances, all the states in the study area have some program to reclaim land disturbed by mining administered under the 3809 regulations. For mining involving less than 3 to 5 acres of surface disturbance, certain states including Arizona, Alaska, Montana, Nevada, and Washington do not require operators to notify state authorities of surface-disturbing activities or reclamation. The emphasis of the state mine reclamation programs, therefore, tends to be on the larger mines. State requirements for revegetation upon final reclamation are similar to BLM's existing mining regulations.

State agencies are usually staffed at much lower levels than their federal counterparts and are usually located in one central place. BLM, in comparison, has field offices throughout the western states and near the mining and the public lands it manages. Besides having geologists who administer the 3809 regulations, BLM offices also have vegetation and reclamation specialists whose expertise would ensure that desirable plants are used for revegetation and who could monitor the success of vegetation establishment.

The nature and extent of the impacts on vegetation and associated reclamation efforts under the State Management Alternative would be similar to those expected under the existing regulations, management practices, and policies. Under the assumption that exploration and mining would increase by up to 5%, an estimated 13,100 acres per year would be disturbed. Compliance with requirements in most states would likely continue at current levels once state programs have had an opportunity to staff up to address the increased workload.

Under the State Management Alternative weed control would depend on state and local efforts. The lack of a comprehensive policy would likely increase the potential for infestations.

Alternative 3: Proposed Action

Under The Proposed Action the rate of mining would decrease by up to 5% from that under the existing regulations. This decrease translates into an average surface disturbance of about 11,800 acres per year.

Alternative 3 stipulates that the reclaimed areas would need to be comparable in diversity and density to the preexisting natural vegetation. This stipulation implies a higher and more difficult goal of revegetation than is required under the existing regulations. Under the current program, vegetation success and release are specified for a particular project or plan, typically by comparing the total plant cover of reclaimed areas to adjacent undisturbed areas (Ross 1996). The new regulations would add the element of diversity to this comparison. Diversity, the number of different species of plants and life forms (grasses, forbs, shrubs, and trees) occurring on a reclaimed site, would need to approximate what existed on the site before mining. In addition, the proposed new regulations stress the use of native plants.

Alternative 3 stipulates the use of replacement growth media where the topsoil is of such poor quality as to limit plant growth. Such use would tend to increase the amount of vegetation (biomass) and diversity of plants that could be established and grown on a reclaimed site. But the new vegetation would not necessarily represent the plant community that existed before mining.

Under the Proposed Action, operations would be managed to prevent the introducing of noxious weeds and control existing infestations. Noxious weeds are plants that often compete and eliminate or diminish the growth of other plants, especially, native plants. Controlling infestations and managing the spread of noxious weeds would enhance the success in sustaining native plants and establishing a productive and desirable plant community after mining disturbances have been reclaimed.

Alternative 4: Maximum Protection

Under Alternative 4 the rate of mining would decrease by up to 30% from mining under the existing regulations. This decrease translates into an average disturbance of 9,800 acres per year.

Alternative 4 stipulates that the soil subsurface in addition to the topsoil would be stripped and stockpiled for use in reclamation. To a greater extent than the existing or proposed regulations, this measure would help in restoring the soil that existed before mining.

Alternative 4 would also allow only native plant species to be used for revegetation. Many native plants are narrowly adapted to particular types of soils. Salvaging and incorporating more of the soil profile back onto the reconstructed surfaces would help establish native plants. But many beneficial soil characteristics, such as structure or soil microrganisms, would be lost or diminished by stripping, stockpiling, and reapplying the topsoil and subsoils. Plants that depend on these lost characteristics could not establish themselves.

Alternative 4 stipulates that, in addition to being comparable in diversity and density to the preexisting natural vegetation as under the Proposed Action, the canopy cover of vegetation on reclaimed areas would also have to be at least 90% of the canopy cover of the adjacent undisturbed lands. Under the existing regulations, vegetation success and release are specified for a particular project or plan typically by comparing total plant cover of reclaimed areas to adjacent undisturbed areas (Ross 1996). Alternative 4, like Alternative 3, would also add the element of diversity to this comparison. The diversity, the number of species of plants and life forms (grasses, forbs, shrubs, and trees) on the reclaimed site would need to approximate or equal the diversity of the site before mining.

Under Alternative 4 revegetation would be limited to the use of native plants, which would reduce the number of plant species that a reclamation specialists could choose from for reclaiming and stabilizing mine sites. But revegetation under Alternative 4 would result in restoring mine sites to a condition more closely resembling that of a predisturbance vegetation community than would the other alternatives.

The Maximum Protection Alternative would also require mining operations to prevent the introducing of noxious weeds and eliminate existing infestations. This requirement would enhance success in sustaining native plants as well as establishing a productive and desirable plant community after reclamation. Eliminating existing infestations might not always be feasible and would probably require the use of herbicides.

Riparian-Wetland Resources

Affected Environment

BLM manages 23 million acres of riparian areas and wetlands. Even though this ecotype represents only 9% of the land BLM manages, it consists of some of the most productive habitat on BLM managed land. These valuable riparian-wetlands are not protected under one comprehensive national wetland law. Rather, federal statutes regulating or otherwise protecting wetlands have evolved piecemeal over the years and often use laws intended for other purposes (GAO 1991b). Definitions used by agencies to determine regulatory jurisdiction over riparian- wetland areas are as variable as the classifications of riparian-wetland areas themselves (Cowardin and others 1979). The two definitions described below are used by the U.S. Army Corps of Engineers and BLM for managing wetlands on BLM-administered lands.

Congress enacted the Clean Water Act in 1972 to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. Section 404 of the Clean Water Act authorizes the Secretary of the Army to issue permits for the discharge of dredged or fill material into the waters of the United States, including wetlands. During 1987 the Army Corps of Engineers established the guidelines and methods for determining whether an area is a wetland (jurisdictional) for the purposes of permitting and enforcing Section 404. The Army Corps of Engineers and Environmental Protection Agency (EPA) defined "wetland" as follows:

> *Those areas that are inundated or saturated by surface or ground water (hydrology) at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation (hydrophytes) typically adapted for life in saturated soil conditions (hydric soils). Wetlands generally include swamps, marshes, bogs, and similar areas (40 CFR 232.2(r), Environmental Laboratory 1987).*

Jurisdictional wetlands—those regulated by the Army Corps of Engineers under Section 404 of the Clean Water Act—must exhibit all three characteristics: hydrophytes, hydric soils, and hydrology. The prevalent vegetation must consist of hydrophytic species, meaning species that can grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions. Hydric soils must be present, or the soils must have characteristics of reducing soil conditions. Last, the area must be inundated either permanently or periodically at water depths of œ 6.6 feet, or the soil must be saturated to the surface at some time during the growing season of the prevalent vegetation (Environmental Laboratory 1987).

During 1991 BLM developed its Riparian-Wetland Initiative for the 1990's (BLM 1991b) to provide a strategy for managing and restoring riparian-wetland areas on BLM lands. BLM Manual 1737, Riparian-Wetland Area Management, defines riparian-wetland areas as follows:

> *A form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes*

> *and reservoirs with stable water levels are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.*

The Army Corps of Engineers does not regulate all areas that BLM considers riparian-wetland. The Corps' regulatory jurisdiction applies only to wetlands that have all three attributes: hydrophytes, hydric soils, and hydrology. BLM recognizes areas exhibiting any one of these attributes (hydrophytic vegetation) as riparian-wetland areas.

Proper Functioning Condition

One of the chief goals of BLM's Riparian-Wetland Initiative is to restore and maintain riparian-wetland areas in proper functioning condition. Proper functioning condition for riparian-wetland areas is defined in BLM Technical Reference 1737-9 (BLM 1995a):

> *Riparian-Wetland areas are functioning in proper condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediments, capture bedload, and aid floodplain development; improve flood-water retention and ground water recharge; develop root masses that stabilize stream banks against cutting action; and develop diverse ponding and channel characteristics are created to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The functioning condition of riparian-wetland areas is a result of interaction among geology, soil, water, and vegetation.*

Riparian-wetland areas that are not functioning properly are rated as functional—at risk or nonfunctional. Functional—at risk areas are in functional condition, but an existing soil, water, or vegetation condition makes them susceptible to degradation. Nonfunctional areas are clearly not providing adequate vegetation, landform, or large woody debris to dissipate the stream energy of high flows and thus are not reducing erosion, improving water quality, and performing the other functions listed above. The absence of certain physical attributes, such as, a lack of floodplain, are indicators of nonfunctioning condition.

Riparian-Wetland Functions

The capability and potential of any riparian-wetland area is dictated by the interactions of water, soils/landforms, and vegetation. These interactions depend largely on the climatic extent and frequency of flooding and drought. Water that infiltrates into floodplains of lotic (streams, springs) systems during periods of high flow returns to the channel during periods of low flow, contributing a cool source of summer base flow for many streams, especially in low-elevation alluvial valleys. Seasonal inundation of the floodplain also reduces water velocities during flooding and aids in reducing downstream flood peaks, both factors that reduce risk of channel erosion. Lentic riparian-wetland areas (bogs, marshes, swamps) also perform many of the same functions, such as detaining storm runoff, reducing flow peaks and erosion potential, retaining and filtering sediment, and augmenting ground water recharge by storing water and releasing it more slowly, later into the dry season.

Riparian-wetland vegetation plays a critical role in many physical processes within all riparian- wetland areas. It promotes streambank stability and contributes organic matter and large woody material to riparian-wetland areas. Densely vegetated riparian-wetland areas buffer the input of sediment and toxic chemicals from runoff generated on adjacent lands. Riparian-wetland vegetation also aids in aquifer recharge and in floodplain development by trapping sediment (Gregory and others 1991; Henjum and others 1994; Hicks and others 1991; Kovalchik and Elmore 1992; Sedell and others 1990).

The Role of Riparian-Wetlands as Habitat

Riparian-wetlands contain the most biologically diverse habitats on BLM-managed lands because of their proximity to water bodies and because they provide a variety of structural features, including live and dead vegetation. Riparian-wetland areas are valuable to wildlife for food, cover, and water, and provide important habitat for about 80% of our wildlife species. Riparian-wetland areas provide nesting and brooding habitat for birds. And these areas provide thermal cover and favorable microclimates because of their shade, increased humidity and air movement, and higher rate of transpiration. Common deciduous trees and shrubs, such as cottonwood, alder, and willow, are important food sources for deer, elk, moose, hares, rabbits, voles, and other animals.

Riparian-wetlands also serve as big game migration routes between summer and winter range; provide travel corridors between habitat types for many species, including carnivores, birds, bats, and small mammals; and play an essential role within landscapes as corridors for the dispersal of plants. These areas are used by more birds species than any other habitat type. Many neotropical migratory birds use these areas exclusively or in combination with only one other habitat type. In the Interior Columbia River Basin, 64% of neotropical migratory land birds depend on riparian-wetland vegetation during the breeding season. This habitat may harbor from 2-10 times as many individual birds as does adjacent, nonriparian-wetland vegetation (Partners in Flight 1998).

Riparian-wetland vegetation directly influences the condition, quality, and maintenance of aquatic habitat. The complexity, hydraulic resistance, and stability provided by riparian vegetation to streams often affects the size, shape, and distribution of channel features such as pools, riffles, and undercut banks (Sedell and Beschta 1991). Streamside vegetation moderates water temperatures throughout the year by creating shade in the summer and providing insulation in the winter. The sediment and chemical filtering function of riparian-wetland vegetation helps maintain high water quality required by many aquatic organisms. Riparian-wetland vegetation also alters the relatively simple chemistry of nutrient production and transport into a complex array of storage locations, transformations, and nutrient spirals (Gregory and others 1987; Pinay and others 1990). In addition, riparian-wetland vegetation helps to maintain the hydrologic connectivity between main-stem stream channels and smaller side channels and hyporheic zones (Stanford and Ward 1988; Gilbert and others 1990).

Status of Riparian-Wetland Areas

Over the past 100-150 years, riparian areas and wetlands have been subject to increasingly concentrated and competing resource demands, including water withdrawal; mineral, sand, and gravel extraction; human settlement; farming; timber harvesting, livestock and wildlife use; and recreation. Many riparian-wetlands have been drained, filled, or sprayed with herbicides and pesticides. Additionally, riparian-wetland areas have been affected by the invasion of nonnative plants and introduced aquatic and terrestrial species (bullfrogs, nutria). On many sites these nonnative species have become well established, commonly replacing native species or exerting large influences on native habitats. As a result, many riparian areas and wetlands are considerably altered from conditions noted by explorers in the early 1800s. Riparian-wetland systems are responsive and dynamic. When modified, they can significantly affect adjacent aquatic and terrestrial ecosystems.

Broad-scaled trends generally show that riparian-wetland areas have been reduced in abundance and that habitat fragmentation has significantly increased. In some regions of the country 95% of the riparian-wetlands historically present are gone. According to BLM (1998c), 58% of all flowing-water areas that have been assessed are either nonfunctional or functional—at risk, whereas 26% of all standing-water areas were assessed as nonfunctional or functional—at risk. BLM reported that from 1981 to 1997 a total of

20,127 acres of riparian-wetland habitat was lost or degraded by placer mining alone. Other types of mining also affect riparian-wetlands but to a lesser degree. For example, riparian-wetland disturbance estimates in the Zortman-Landusky Mine EIS suggest that from 1-2% of the total land affected by open pit mining may be riparian-wetlands (BLM and Montana Dept. of Environmental Quality 1996). Some of the mining since 1981, particularly placer mining, has taken place on lands previously or historically mined. Previously disturbed riparian-wetland areas are in various states of recovery. Most of these areas would be classified as nonfunctional or functional—at risk.

Effects of Mining on Riparian-Wetland Systems

Natural riparian-wetlands have evolved over tens, hundreds, and thousands of years. It may take 2 to 3 years for herbaceous riparian-wetlands to become structurally established, 15 years for a carefully managed forested riparian-wetland area to achieve canopy closure and to begin to look and function like a natural forested system, and decades to centuries before the area approximates the structure and function for the habitat that it was intended to duplicate (NCSU 1998; BLM and Montana Dept. of Environmental Quality 1996; BLM 1988a).

Loss of Vegetation and Vegetative Function. Mining activities, placer operations in particular, lead to a loss of riparian-wetland vegetation. All vegetation within the active mining area is removed before and during mine development and operation. Immediately adjacent vegetation may be affected by roads, water diversions, or other development. Riparian-wetland vegetation significantly influences the stability of uplands and certain stream types. Changes in the composition, vigor, and density of riparian vegetation can result in changes in sediment input from uplands, stream shade, protection from instream erosional processes, terrestrial insect habitat, and the contribution of detritus and structural components to the stream channel. Water quality and esthetic values are also affected by disturbance to riparian-wetlands (Rosgen 1996).

Nonnative Species. One of the most pervasive and ecologically damaging effects of human activities is widespread movement of species beyond their natural range. In North America, hundreds of exotic plants have become established in aquatic habitats during this century (Ricciardi and Rasmussen 1998). Typically, only a small proportion of introduced species cause significant impacts, but some of these have had enormous ecological impacts (Schmitz and Simberloff 1997). Nationwide, nonnative species have been implicated in the decline of 42% of species listed under the Endangered Species Act.

The ability of nonnative species to spread rapidly and out compete native plants is of concern because weeds can render land unfit or greatly limit beneficial uses of the land. Human disturbance of wetland systems, by activities such as mining, creates conditions that may encourage the spread of invasive species. Wetland creation or restoration projects that include nonnative species can contribute to the problem by promoting their spread faster than through natural dispersal. Although wetlands that are reclaimed with/or invaded by nonnative vegetation appear to be healthy, they have little or no value for biodiversity (Flack and Benton 1998). Furthermore, some introduced species can alter riparian-wetland ecosystems processes and functions, and others may change the structure and composition of natural communities. Many riparian-wetland invaders alter the hydrologic dynamics, fire regimes, nutrient cycling, soil chemistry, or sedimentation rates in systems where they occur (Flack and Benton 1998).

Some species such as salt cedar (tamarisk) can seriously alter hydrological regimes. Tamarisk is a deep-rooted plant that transpires water at a much higher rate than native riparian-wetland species. As a result, tamarisk can lower the water table substantially. It also promotes flooding by blocking water channels.

Spotted knapweed and yellow star thistle are two of many weeds that can infest a variety of habitat types, including hydric sites. Both weeds are highly competitive and easily invade disturbed lands or deteriorated sites. These weeds are deep-rooted and can out compete native species with shallow roots, thereby creating weed monocultures. Spotted knapweed can inhibit the growth of surrounding vegetation by exuding toxins through its roots and leaves. As these weeds out compete the native species, the amount of bare ground increases. Increased bare ground can lead to problems with streambank stability and increased sedimentation, especially during peak flow periods (Williams 1997b; Elmore and Leonard 1998). Healthy riparian-wetland systems may out compete nonnative weed invasions and also inhibit the dissemination of weed seeds through filtering capabilities.

Erosion, Sedimentation, and Altered Stream Channel Morphology. Mining accelerates sediment production. Because of the large area of land disturbed by mining and the large amounts of earthen materials exposed at sites, erosion can be a major concern at mining sites. Erosion may cause significant loadings of sediments to nearby water bodies and riparian-wetland areas, especially during severe storms and high snow melt periods. Placer mining inherently degrades or destroys channel features, resulting in increased erosion and sedimentation. Fine sediment from erosion can clog wetland vegetation and impair the water-holding capacity. Excessive sediment loading can cause channel aggradation and further accelerate bank instability (Elmore and Leonard 1998).

In streams with hard bottoms accelerated runoff can result in destructive lateral erosion of streambanks and progressively wider and shallower stream channels. In soft bottom streams accelerated runoff can trigger downcutting, which lowers the streambed and water table, dries out riparian areas, destabilizes streambanks, increases erosion, and further accelerates runoff. Unless stopped by some form of intervention or a hard geologic formation, downcutting will migrate upstream and eventually disrupt the hydrologic functioning of the entire watershed (Chaney and others 1993).

Surface erosion, which occurs in denuded areas, is a major factor contributing to sedimentation in rivers An example of how surface erosion can play a major role in introducing sediment into rivers was demonstrated by a New Mexico study that found that surface erosion produced 13,600 tons per square mile per year, gully erosion contributed 200 tons, and mass movement involved 90 tons (Leopold 1994). Stream channel instability occurs when excessive sediment deposition leads to destructive lateral erosion of streambank and progressively wider and shallower stream channels.

Stream channels are commonly relocated into bypass channels during placer operations. Alterations of channel morphology result in three possible outcomes. (1) Moving the main water flow from a natural channel to an upland soil and associated vegetation can result in either vertical or lateral instability depending on the soil type and underlying geology. (2) Stream channel relocation often results in the straightening or decreasing of the total channel length. This decrease in length increases the gradient and energy, resulting in incision. Downcutting from such an incision can progress far above the disturbed area with the resulting sediments affecting stream morphology far downstream. (3) Sediment overloading from direct inputs such as waste rock, overburden, and tailings piles; dams; roads; and newly reclaimed areas can cause channel aggradation from increased bedload. Channel aggradation increases stream energy on banks and can start lateral instability and further sedimentation. In addition, increased velocities and volume of runoff can lead to downstream flooding, scouring of stream channels, and a loss of streamside riparian vegetation (Elmore and Leonard 1998).

Pollution. Mining can release pollutants to surface and ground water, result in the depositing of contaminants into soils, and eventually lead to incorporating pollutants into plant tissue. Both water and soil contamination may harm riparian-wetland vegetation. Studies have shown a general relationship between concentrations of metals in soils and in plants

(Mullen 1994; Lipton and others 1993).

Total metal accumulation by plants from soil depends on many factors, including (1) the nature of the plants, species, growth rate, root size and depth, transpiration rate, and nutritional requirements; (2) soil factors such as pH, organic matter content and nature, nutrient status, amount of metal sulfides, and clay content and type; (3) environmental and management variables such as temperature, moisture, sunlight, and amendments and fertilization; and (4) modes of metal toxicity and plant tolerance (Overcash and Pal 1979).

General effects of metal accumulation in plants include stunted growth of roots and tops, browning of leaves, interveinal chlorosis, wilting of the leaves, and red or brown spots on the leaves. But each case of plant phytotoxicity is different, and many plants may show no visible signs of injury (BLM and Montana Dept. of Environmental Quality 1996).

Naturally occurring substances in the ore may create a major source of pollutants. Mined ore contains not only the mineral being extracted but varying concentrations of a wide range of other minerals. Often other minerals may be present at much higher concentrations and can be much more mobile than the target mineral. Depending on the local geology, the ore and the surrounding waste rock and overburden can include trace levels of aluminum, arsenic, asbestos, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, selenium, and zinc, as well as naturally occurring radioactive materials.

Ground Water Drawdown. Ground water drawdown and associated impacts to surface waters and nearby wetlands can be a serious concern in some areas, particularly in the Carlin Trend of northeast Nevada. Several Carlin Trend gold mines are dewatering open pits. One mine is permitted to pump more than 60,000 gallons/minute. Cumulatively, the pumping could curtail flows in the Humboldt River and its tributaries and degrade or eliminate riparian-wetland areas. For example, Newmont Gold's South Operations project could result in impacts to 1,342 acres of riparian-wetland (streambank) habitat, 857 acres of which are jurisdictional waters of the United States. Ten more acres of seeps and springs at 25 sites could also be affected. Ground water pumping at 2 of the largest 15 or so mines that are or will be dewatering in the area—the Newmont Gold's South Operations site and the nearby Barrick Gold Corporation's Betze Pit— could cumulatively affect 2,700 acres of riparian-wetlands (EPA 1997).

The impacts of ground water drawdown could last for many decades. During dewatering, pumped water could be discharged, after proper treatment, to mitigate reduced surface flows. But when dewatering ceases, the aquifer might take many decades to recharge, and continued streamflow reduction in the Humboldt River and its tributaries might result.

Mitigation. The most common mitigation practice applied to mine-related loss or disturbance is to create replacement riparian-wetland areas. Small- and large-scale mitigation can be successful and have positive ecological benefits for an area. When properly designed and maintained, the new riparian-wetland areas will eventually emulate natural systems. Although mitigation ideally provides a mechanism for accommodating both development and the protection of riparian-wetland functions, the uncertainty of creating riparian-wetlands has been a subject of concern (Reutter and Brinckerhoff 1998).

Regulatory and Enforcement Concerns. Street (1998), Reutter and Brinckerhoff (1998), and Sibbing (1997) discussed a number of problems in the mitigation process. First, few permitted riparian-wetland mitigation projects follow scientific designs. Instead, projects are often negotiated between the applicant and the regulatory agency with less site assessment or mitigation design than might be needed to guarantee success. Second, many mitigation projects fail for a lack of sustained hydrology. Poor planning and unexpected results of construction often lead to a change in ground or surface water supply to small, marginal-quality riparian-wetland areas.

Permittees may often not build wetlands, may not build a large enough area, or may build riparian-wetland areas that otherwise do not comply with the design specified in their permit. Permitting agencies sometimes allow the substitution of unlike types of riparian-wetlands in mitigation or require less-than-equal amounts of mitigation. Constructed riparian-wetland areas often do not function as expected. Finally, agency compliance monitoring is often inconsistent or cursory for key components and does not consist of detailed studies to evaluate wetland function.

Functional Replacement Concerns. A significant problem noted in mitigation compliance surveys is that, although complex wetlands may be affected, different, simpler riparian-wetland types are often created through mitigation programs. For example, some agencies lean toward the construction of deeper and open water systems. This type of out-of-kind creation or restoration ignores the unique values of drier-end areas, including their role in flood water storage, habitat for reptiles and amphibians, food sources for migratory waterfowl and shorebirds, and water quality improvement. Also ignored is the fact that many nonregulatory wetland incentive programs target restoration of these same kinds of emergent wetlands, slighting drier-end wetlands (Sibbing 1997). But out-of-kind mitigation can be beneficial if the wetland is dysfunctional to begin with.

Wetland functions may take many years to develop. Wooded wetlands, in particular, take a long time to become established because it takes time for the trees and shrubs to grow. Street (1998) found that a 5-year monitoring program was inadequate for assessing the effectiveness of a mitigation prescription in a wooded area. The mitigation sites examined in the study had begun to exhibit some wetland functions, but many years would be needed to see the ultimate functions provided by the sites. Street noted several factors that would hinder the ability of sites to develop riparian-wetland functions.

The methodologies used in building mitigation sites might result in failure. Typically, construction of riparian-wetland areas includes the excavation of large amounts of soils to reach the level of seasonal-high ground water table. Commonly, construction strips off the developed soil profile and topsoil and exposes the underlying subsoil of parent material. Although the organic matter is added to or stockpiled, little organic material remains for later incorporation. With little soil organic matter, it becomes more difficult for wetlands to remove nutrients from the ground and surface water, resulting in soils less likely to support vegetation that will filter nutrients, sediments, and pollutants. Additionally, the ability of mitigation projects to compensate for lost functions would be limited by the hydrogeomorphic characteristics of a site (Street 1998).

Location-Dependent Functions. Many of the functions and values of a particular riparian-wetland area are site specific. For this reason an agreement reached between the Army Corps of Engineers and EPA in 1990 determined that on-site mitigation would be used when possible. If on-site mitigation is not possible, then mitigation should occur nearby and within the same watershed. Only when there are no other options should mitigation occur outside the watershed of the affected wetland. Functions tied to landscape position include aspects of water storage and attenuation, species habitat, and nutrient cycling.

Temporal Replacement of Functions. The standard practice of constructing mitigation areas concurrently with conducting permitted wetland impacts results in temporal loss of wetland functions while the newly created areas become established, a process that can take years, even under favorable conditions. Project may pay little regard to short-term riparian-wetland function, and many regulatory programs do not try to offset this temporal loss of function (Reutter and Brinckerhoff 1998).

Environmental Consequences

Impacts Common to All Alternatives

The nature of impacts, as discussed above, would be similar for all alternatives where disturbance is unavoidable in accessing and extracting minerals from an ore body. In summary, loss and degradation of riparian-wetland areas may result from the direct removal (stripping) of vegetation and loss of vegetative function, increased erosion and sedimentation, water and soil contamination, and ground water drawdown. Discounting replacement or restoration from mitigation, the predicted total disturbance for each of the four alternatives would range from 20,780 to 24,290 acres over 20 years. The level of mitigation required by each of the alternatives would help offset disturbance as discussed below.

Under all four alternatives impacts to jurisdictional wetlands would be mitigated according to Section 404 of the Clean Water Act and administered by the Army Corps of Engineers with oversight from EPA. State mitigation might also help offset wetland loss in states requiring wetland mitigation.

Alternative 1: No Action

Under No Action 23,630 acres of riparian-wetland habitat would be lost or degraded. This equates to an average annual loss of 1,180 acre/year. An additional 10-25 acres/year would likely be lost or degraded due to other types of mining.

Alternative 1 has no specific requirement to avoid disturbance or mitigate impacts to nonjurisdictional riparian-wetland habitat. Riparian-wetland mitigation, however, is generally conducted as a part of fish and wildlife rehabilitation or with water quality improvements. One of the goals of BLM's riparian-wetland policy is to restore or maintain riparian-wetland areas in proper functioning condition. But mitigation would not necessarily do the following: be conducted on an acre-disturbed-per-acre-restored basis; provide for scientifically designed restoration based on site-specific riparian-wetland assessments; or replace lost riparian-wetland function with a similarly functioning system in a timely manner. Many years or decades would be needed for newly created riparian-wetlands to function in a manner similar to the natural systems they are designed to replace.

In addition, project mitigation usually would not consider the spacial distribution of natural riparian-wetland systems. Because water quality and fish and wildlife habitat parameters are more strongly correlated to riparian-wetland position than riparian-wetland extent (Pastor and Johnston 1992), the goal of attaining proper functioning condition may not be met.

Alternative 2: State Management

Under State Management 24,290 acres of riparian-wetlands would be lost due to the predicted 5% increase in placer mining. Over the long term, however, Alternative 2 might result in substantially more riparian-wetland habitat remaining in a nonfunctional or impaired condition than would Alternative 1.

Because mitigation would be required only for jurisdictional wetlands (and not riparian-wetlands meeting BLM's definition), riparian-wetlands would not be restored on a large portion of the disturbed riparian-wetland habitat. For example, Newmont Gold's South Operations project could result in impacts to 1,342 acres of riparian-wetland (streambank) habitat, of which 64% is within the jurisdiction of the Army Corps of Engineers (EPA 1997). If jurisdictional wetlands make up 64% of the total affected riparian-wetland area, Alternative 2 could result in a long-term loss of 36% more riparian-wetland areas than would Alternative 1, except in states having standards addressing the postmining condition of fish and wildlife habitat. In these states, riparian-wetlands might indirectly benefit as a result of mitigation or rehabilitation measures required for fish and wildlife resources. For example, California recommends that wildlife habitat be restored to its premining condition (McElfish and others 1996).

Alternative 3: Proposed Action

Because of the predicted 5% or less decrease in placer activity under the Proposed Action, 22,960 acres of riparian-wetland habitat would be lost or degraded over the next 20 years. This degradation equates to 1,150 acres/year.

Disturbance to riparian-wetland habitat would likely be reduced in areas away from the ore body. Such areas would undergo less disturbance from construction of access, waste rock placement, tailings impoundments, and leaching facilities. Riparian-wetlands within the area of the ore body would likely be lost or degraded. Where disturbance is unavoidable, riparian-wetland mitigation would be required. The weakness in the mitigation process would be that similarly functioning riparian-wetlands would probably not be replaced in a timely manner or by similarly located riparian-wetlands. Many years or decades would be required for newly created riparian-wetlands to function in a manner similar to that of the natural systems they are designed to replace. BLM's ability to require baseline environmental information, such as detailed studies of riparian-wetland function, should help increase the success rate of riparian-wetland mitigation through improved design.

Alternative 4: Maximum Protection

Because of 10-15% decrease in placer activity, 20,780 acres of riparian-wetland habitat would be lost or degraded over the next 20 years under the Maximum Protection Alternative. This amount equates to 1,040 acres/year. But because of the irreparable harm standard and the time requirement for riparian restoration, the actual disturbance could be substantially less.

The nature of impacts to riparian-wetland resources would generally be similar to that of the other alternatives, but the duration and extent of the impacts could be greatly reduced by the restoration time requirement. As under Alternative 3, disturbance to riparian-wetland habitat would be reduced in areas away from the immediate vicinity of the ore body. Riparian-wetlands within the area of the ore body would likely be lost or degraded. Where disturbance is unavoidable, riparian-wetlands would be restored or replaced to a proper functioning condition within 10 years of the completion of mining and at a rate of 1.5 acres restored per 1 acre disturbed. The less-than-certain nature of mitigation would be somewhat offset by the time requirement for restoration, the proper functioning condition standard, the greater restoration-to- disturbance ratio, and the ability of BLM to require baseline environmental information, such as detailed studies of riparian-wetland function.

In addition, if the Plan of Operations predicts that the operation would not meet the time requirement for restoring proper functioning condition, BLM could deny the proposal to mine. This would likely be the case when mine proposals might disturb complex riparian-wetland habitats, such as bogs and fens, that take hundreds to thousands of years to mature.

Aquatic Resources

Affected Environment

The aquatic community consists of three main components: (1) aquatic plants (phytoplankton, periphyton, and rooted vascular macrophytes), which fix energy from sunlight; (2) bacteria and fungi, which decompose organic matter; and (3) consumers, including invertebrates and fish, which use energy from plants, bacteria, and fungi. The habitat requirements for fish include a healthy, functioning aquatic ecosystem consisting of all three community components, as well as the proper physical and chemical attributes.

Aquatic Habitat and the Fish It Supports

BLM manages 132,190 miles of fish-bearing stream habitat, which includes 17,281 miles of habitat used by anadromous species. In addition, BLM manages more than 2.9 million surface acres of lake and reservoir habitat (Table 3-20).

This habitat ranges from high mountain lakes to reservoirs and from large rivers to small first- order tributaries. These aquatic systems occur in a wide variety of climatic and regional settings, ranging from the arid regions of Arizona, New Mexico, and southern California, to the more temperate streams of the Pacific Northwest and the arctic systems of Alaska.

Of the total aquatic habitat under BLM administration, 7% (9,170 miles) of the stream and 0.3% (8,210 acres) of the lake habitat are under or proposed for special status. The breakdown of the special status areas is as follows: 3,200 miles of stream and 1,500 acres of lake habitat are classified as areas of critical environmental concern, 90 stream miles are in wilderness areas, 1,600 stream miles and 250 surface acres of lake are in national conservation areas, 1,100 miles of stream are classified as wild and scenic, 1,200 stream miles and 5,600 surface acres of lake are in wilderness study areas (covered under 43 CFR 3802), and 1,980 stream miles and 860 surface acres of lake have been proposed for special designation (BLM 1993).

To date only about 3% of the stream habitat and 1% of the lake habitat under BLM management have been intensively inventoried for habitat condition, quantity, and trend, or have had management objectives developed through habitat management plans (BLM 1993; 1996a). Of the 1,700 miles of nonanadromous stream and 39,500 acres of lake habitat for which objectives have been developed, about half of the habitat meets the objectives (BLM 1993). About 33% (1,220 miles) of the anadromous stream habitat managed by BLM in California, Oregon, Washington, and Idaho is in optimal condition. The remainder is in fair to minimal condition. In Alaska 98% (14,800 miles) of the anadromous stream habitat under BLM management is considered to be in natural or near-natural condition, and 2% (319 miles) is in fair to minimal condition (BLM 1996a). BLM defines optimal, fair, and minimal aquatic habitat conditions as follows:

Optimal aquatic habitat condition - watershed not greatly impacted. Riparian areas in near natural condition; abundant, diverse instream structure. Numerous deep, complex pools with cover. Substrate (gravels) relatively free of fine sediment. Stable streambanks and stream channels. Water quality and quantity are generally unaltered from natural conditions.

Fair aquatic habitat condition - watershed

Table 3-20. BLM-Managed Fisheries Habitat by State

State	Total Fish-bearing Stream Miles	Anadromous Stream Miles	Lake and Reservoir Surface Acres
Alaska	115,000	15,145	2,600,000
Arizona	700	0	14,200
California	850	220	163,000
Colorado	1,900	0	17,600
Eastern States	20	0	3,620
Idaho	2,820	314	750
Montana	720	0	6,670
New Mexico	260	0	120
Nevada	1,400	0	33,190
Oregon/Washington	3,200	1,602	32,770
Utah	3,390	0	15,230
Wyoming	1,930	0	6,430
Totals	132,190	17,281	2,893,580

Source: BLM 1993, 1996a.

minimally impacted by activities in the past; natural riparian vegetation altered or removed in past; limited amounts of large woody debris; fine sediments above natural levels; some adverse changes in water quality and quantity; habitat partly recovered or still in a decreasing trend.

Minimal aquatic habitat condition - major alterations in the watershed, water quality, water quantity, or natural stream habitat and riparian areas; few or no large trees or mature native vegetation in riparian areas; little or no large woody debris; pools few and shallow; and excessive sedimentation of the streambed.

From 4 to 8% of the 790 species of native freshwater fish in the United States can be found in each of the western states within the study area (Page and Burr 1991). About 90% of these fish are nongame species, and many have a very limited distribution and are found nowhere else in the world. The species found on BLM public lands are best represented by members of the following families: Salmonidae (nonanadromous and anadromous salmonids); Cottidae (sculpin); Catostomidae (suckers); Esocidae (pike); Percidae (darters and other perches); Centrarchidae (sunfishes); Cyprinidae (minnows); Cyprinodontidae (killifishes); Ictaluridae (bullhead catfishes); Petromyzontidae (lampreys); Gadidae (burbot); and Gasterosteidae (sticklebacks). Much is known about the life history and habitat requirements of some of these species, and nothing is known about others. All of the species are important to the natural functioning of their associated ecosystems, and many species have social or economic value to humans.

Habitat Factors That Influence Fish Abundance

Habitat needs for fish vary with the species, season of the year, and life stage. A variety of chemical, physical, and biological parameters interact to provide the range of environmental conditions that allow the species to exist. Some of the more important parameters include water quality, streamflow, cover, substrate, and energy (food) availability. These parameters are directly influenced by riparian function, but climate, geology, soils, topography, upland vegetation, hydrology, and land use within a watershed all play a role in defining the condition and quality of the aquatic environment. Fish respond to these parameters both physiologically (altered growth rates and health) and behaviorally (site selection and community interaction). Fish generally respond to these environmental factors in combination. Where fish can live and reproduce, the range of environmental conditions must be suitable throughout their lives. To show the complexity and often narrow range of environmental conditions required by fish the following narrative [from Bjornn and Reiser (1991) unless otherwise cited] discusses the habitat requirements of salmonids (e.g. trout, salmon, and char), a group that represents many species found in streams near land open to mining.

Water Quality. Salmonids require water that has a high concentration of dissolved oxygen (>75% saturation), is nearly neutral to slightly alkaline (pH 6.5-8.7), is free from toxic concentrations of heavy metals and other toxic chemicals, and has sediment levels (bedload and suspended) that approximate natural undisturbed conditions. In addition, water temperature plays a crucial role in defining suitable water quality for fish.

The timing of salmonid spawning has evolved in response to water temperatures in each stream before, during, and after spawning. Water temperatures can influence the upstream migration of adult spawners and delay the entry of spawners into their natal streams. Temperature also determines the rate of embryo and alevin (newly hatched fish still attached to the egg yolk) development. Within the temperature threshold for successful spawning and incubation, 4-14°C (Bell 1986), warmer temperatures result in shorter development times. In many streams winter temperatures fall below the 4°C minimum recommended for incubation, but the eggs develop normally because the spawning and development occurred when temperatures were within the suitable range.

Water temperature also determines the capacity of water to hold oxygen in solution. The relationship is an inverse one, with oxygen solubility lower in warmer water. Salmonids can survive relatively low concentrations of dissolved oxygen, for short periods of time, but swimming performance, growth rate, and food conversion efficiency are adversely affected.

Streamflow and Water Velocity. Adequate streamflow is important for providing fish passage (both for upstream migrating adults and downstream migrating juveniles). Streamflow also regulates the amount of spawning and rearing area by controlling the wetted perimeter, depth, and velocity of water. Streamflow also determines stream channel morphology, bed material particle size, and the sediment transport capacity of the stream. These parameters in turn determine the quality and distribution of aquatic habitat types.

Next to flow, water velocity is probably the most important variable in determining the amount of living space available for fish. If velocities are unsuitable, no fish will be present. Natural streams have a variety of velocities, some of which are suitable for fish. The velocities suitable for salmonids vary with life stage of the fish, the species, and the season of the year.

Cover. In-stream cover provides fish with security from predation and displacement during high flows and allows fish to use portions of a stream they might not otherwise be able to use. Some of the more common cover elements include deep water, water turbulence, large-particle substrates, overhanging riparian vegetation, undercut streambanks, woody debris, and aquatic vegetation. The cover requirements of fish change diurnally, seasonally, and by species and life stage. Cover has been correlated to fish abundance and is an important aspect of quality habitat.

Substrate. Streambed substrate gives juvenile fish cover from predators and adverse environmental conditions, serves as habitat for aquatic invertebrates and often provides a substantial component of the fish's diet, and contributes to the quality of spawning, incubation, and rearing habitat.

In-stream cover is provided by the interstitial space (voids) between substrate particles. In many streams large-particle substrate is the main cover type along with water turbulence and depth. Small-particle substrates, such as silt and sand, are of no value as cover for fish. Small fish, such as newly emerged fry, can use substrates consisting of 2-5 cm diameter rocks, whereas larger fish require cobble- and boulder-size material.

Aquatic invertebrates, which are a primary food for fish, are produced in the substrate. Some types of invertebrates are more suited to fine-particle substrates than others. But watershed disturbance and erosion can add fine sediments, which can reduce the abundance of many species of invertebrates resulting in reduced fish production.

When an adult salmonid selects a spawning site, it is also selecting the incubation environment. During redd (nest) construction, fine sediment and organic material are displaced from the redd, larger substrate material such as gravel and rubble are rearranged, and the site is as favorable to egg development as it will ever be. As the incubation period proceeds, redds may become less suitable to developing embryos if fine sediment and organic material are deposited in the interstitial space between particles. The fine sediment can impede the movement of water and alevins from the redd, and the organic matter can consume dissolved oxygen during decomposition. If the dissolved oxygen is consumed faster than the reduced intragravel water flow can replace it, the embryos or alevins will asphyxiate. The amount of fine sediment deposited and the depth to which it intrudes depends on the size of substrate in the redd, flow conditions in the stream, and the amount and size of sediment being carried.

Energy Flow and Stream Productivity. Stream and terrestrial ecosystems are closely linked. The flow of water, sediment, nutrients, and organic matter from the surrounding watershed shapes the physical habitat and supplies energy and nutrients to the stream community. Activities of the many components of the stream community influence the flow of energy from primary production to decomposition. As predators, salmonids are influenced by energy-flow processes operating at all levels in the stream ecosystem (Murphy and Meehan 1991).

Streams vary in productivity, largely in response to the available nutrients and energy. Energy comes to the stream community from two main sources: photosynthesis by aquatic plants in the stream and decomposition of organic matter imported from upland and riparian areas outside the stream. Imported energy sources contribute organic matter to a stream by four main pathways: litter fall from streamside vegetation, ground water seepage, soil erosion, and fluvial transport from upstream. In addition, animals can contribute important amounts of organic matter and nutrients.

Streamside vegetation provides large amounts of organic matter when leaves, needles, and woody debris fall into the stream. Leaves and needles usually contribute most of the readily usable organic matter in woodland streams.

As much as one-quarter of a stream's total imported organic matter may enter dissolved in ground water. But the nutritional value of this dissolved organic matter is generally low, and this organic matter does not contribute much energy to the stream community (McDowell and Fisher 1976; Klotz and Matson 1978). As with ground water, most dissolved organic matter from soil erosion offers little nutritional value to the stream community.

Fluvial transport of organic material from upstream reaches becomes an energy input to downstream reaches. Upstream reaches can supply up to a third of the total organic input to small streams and nearly all the organic matter in large rivers (Vannote and others 1980). The source of fluvial transport is generated in the stream itself by invertebrate processing of detritus (Webster and Golladay 1984 in Meehan 1991) and algal cells detached from the streambed (Swanson and Bachmann 1976).

Animals transport organic matter to streams in many ways. Terrestrial insects drop into streams and are eaten by fish. Drift of aquatic insects export matter downstream, and mature insects can move matter upstream by flying. Beavers carry woody debris to streams, and grazing and browsing mammals transfer matter by feeding in uplands and defecating in the floodplain. Annual spawning runs of anadromous salmon (and decay of carcasses) can contribute large amounts of organic matter and nutrients to some streams and historically contributed a substantial input of organic material and nutrients to streams.

Influence of Riparian Vegetation. Watershed and riparian community condition directly influences the condition, quality, and maintenance of aquatic habitat. Riparian plants filter sediments and nutrients, provide shade, stabilize streambanks, provide cover in the form of large and small woody debris, produce leaf litter energy inputs, and promote infiltration and recharge of the alluvial aquifer (Orth and White 1993; Wesche 1993). As a result of these functions, spawning beds for salmonids and microhabitats for macroinvertebrates remain relatively free of damaging fine-sediment deposits. Riparian vegetation reduces sedimentation of pools, thereby maintaining water depths and structural diversity of the channel. Base flow levels are augmented throughout the year by the slow release of water stored in aquifers. Complex off-channel habitats, such as backwaters, eddies, and side channels, are often formed by the interaction of streamflow and riparian features such as living vegetation and large woody debris. These areas of slower water provide critical refuge during floods for a variety of aquatic species and serve as rearing areas for juvenile fish.

The bank stabilizing function of streamside vegetation not only helps reduce erosion and influence channel morphology but also acts to supplement in-stream cover by contributing to the development of undercut streambanks and by providing overhanging vegetation. Well-vegetated stream channels and stable streambanks help reduce turbidity and channel scouring resulting from high runoff events and can also enhance primary production. In Alaska and other cold regions, well-vegetated stream channels help reduce the formation of aufeis (ice formed by the overflow of water onto existing ice). Aufeis can decrease primary productivity, delay riparian plant growth, increase erosion, tie up water in the form of ice during critical low-flow periods, and cause the formation of new stream channels due to channel blockage (Churchill 1990; Michel 1971; Slaughter 1990).

Threatened, Endangered, and Special Status Species—Status and Trend

The population status of nonanadromous and anadromous fish species on BLM-managed land ranges from excellent to poor. Many states in the study area show a declining trend in the populations of native species. Alaska has no special status fish species, and Pacific salmon and steelhead have experienced record high abundance in the recent decade (Nehlsen 1996). Conversely, in Oregon, 25 nonanadromous species on BLM-administered land were listed as threatened, endangered, candidate, or sensitive as of 1991, and 79% of the salmon and steelhead stocks are at some risk of extinction (BLM 1996a, 1991a).

In a literature review, Nehlsen and others (1991) found that 106 anadromous salmonid populations are extinct in the Pacific Northwest, and 214 other stocks of Pacific salmon and steelhead are facing high or moderate risk of extinction, or are of special concern. A closer look by Higgins and others (1992), Nickelson and others (1992), and the Washington Department of Fisheries and others (1993) further delineated those stocks listed by Nehlsen and others (1991) and determined that as many as 512 anadromous salmonid stocks are found in the Pacific Northwest. Of the 512 stocks identified, 243 occur on BLM-managed land, and 173 (71%) are at some risk of extinction (BLM 1996a).

In addition to anadromous species, many other rare and imperiled freshwater fishes reside in BLM-managed waters. In a state-by-state study of the status of freshwater fish in the United States, Warren and Burr (1994) found the number of native fish that are endangered, threatened, or of special concern to be particularly high in Nevada (43 spp., 100% of the native fishes), California (42 spp., 72%), Oregon (25 spp., 44%), Arizona (22 spp., 85%), and New Mexico (20 spp., 30%). In these states BLM manages thousands of miles/acres of stream and lake habitat.

Williams and others (1989) documented a 45% increase in the number of freshwater fishes in North America warranting special protection because of their rarity when compared with conditions 10 years earlier. They listed 147 taxa of special concern, 114 threatened, and 103 endangered. Of these 364 taxa 31% occur in waters under BLM administration. As of 1991 BLM-managed lands had 39 species of fish that were listed as threatened or endangered and 73 species considered to be candidate, BLM sensitive, or state-listed species (BLM 1991a). In the past 6 years 26 species of fish have been added to the threatened and endangered list, bringing the total number of threatened and endangered fish on BLM-managed land to 65. These species occur on BLM lands in all states except Alaska. (Appendix F lists threatened, endangered, proposed, and candidate species.)

About 93% of the declines in fish populations are attributed to habitat loss and destruction (Williams and others 1989). But not all habitat loss and destruction have been caused by mining. Physical and chemical degradation results from many factors including dams and diversions; chemical pollution; urban and agricultural encroachment; and damage from timber harvesting, livestock grazing, and mining (Williams 1997a).

Effects of Mining on Aquatic Resources

Since the mid-1800s thousands of miles of aquatic habitat in the western United States have been impaired by mining (USFS 1993a; James 1989, 1991; Chertudi 1986; Kleinman 1989, Kimball and others 1995; Finlayson and Verrue 1980; Canfield and others 1994). It is difficult to measure the amount of BLM-managed aquatic habitat that has been affected since 1981. The data for BLM-managed land does not distinguish between disturbance to aquatic habitat and disturbance to upland areas. In addition, information on disturbance does not include indirect offsite impacts that can be caused by changes to water quality, quantity, or stream morphology.

Finally, the quality of BLM-managed aquatic habitat may be impaired as a result of mining taking place on non-BLM-managed lands upstream or on adjacent uplands. Between 1981 and 1997, an estimated 450 miles of stream on BLM-managed land has been physically altered by placer mining. This estimate considers only direct stream channel disturbance by placer mining and not indirect offsite impacts (e.g., downstream water quality impacts). Nor does this estimate consider disturbance or impacts stemming from exploration; strip, pit, or underground mining; or independent mill sites, all of which would increase the estimate. The estimate of disturbed stream length above was derived by converting past acreage estimates for placer Notice- and Plan-level operations to miles of stream channel by dividing by an average width. The average widths (300 feet for Notices and 600 feet for Plans) were obtained from BLM patent applications.

Physical Impacts. Mining, particularly placer mining, often directly alters or relocates stream channels. This alteration destroys aquatic habitat. During placer mining, streams are often diverted into bypass channels while the original channel is mined. They are then returned to newly built (reclaimed) channels once mining is complete. Stream bypasses and newly reclaimed stream channels are often built with or result in different geometry and physical characteristics (e.g. flood prone and bankfull widths, bankfull depth, sinuosity, slope, entrenchment, and substrate size) than that of the natural unmodified channel. The difference is often due to the removal of streamside vegetation and other hard structural elements that defined the natural channel morphology. As a result, bypasses and newly reclaimed channels are often straighter, have a higher gradient, and consequently have more energy than the natural channel. In addition, new channels often lack the diversity of habitats (pools, glides, riffles) and cover components (undercut bank, overhanging vegetation, large woody debris) that enhance the quality of habitat in natural unmodified channels.

The altering of surface hydrology often results in stream conditions that no longer provide suitable habitat to species or life stages of fish and other aquatic organisms that were present before disturbance. For example, increased stream flow may result in water velocities that (1) cause involuntary downstream displacement and mortality of juveniles, (2) result in scour-related mortality of eggs and alevins, (3) accelerate streambank erosion, (4) create less desirable conditions for adult fish, and (5) over the long term deplete large woody debris and organic material. The enlargement of stream channels may result in a shallow, low-velocity aquatic environment during periods of low flow. This new environment could result in crowding, loss of spawning habitat, reduced primary and secondary productivity, increased vulnerability to predation, and increased sedimentation (Swanston 1991; Hicks and others 1991; National Research Council 1992; Stouder and others 1997).

Mine development may also alter the natural input rate of sediment, organic matter, and nutrients to aquatic systems. Mine sites can include open pits, heap and dump leaches, waste rock and overburden piles, tailings piles and dams, haul roads and access roads, ore stockpiles, vehicle and equipment maintenance areas, and exploration and reclamation areas. These areas are all major sources of erosion and sediment.

The main factors influencing erosion on mine sites include the volume and velocity of runoff from precipitation, the rate of precipitation infiltration through the soil, the amount of plant cover, the slope length or the distance from the point of origin of overland flow to the point of deposition, and operational erosion control structures (EPA 1997). When sediment delivery exceeds that of natural levels, the aquatic environment can be greatly disrupted. Excessive fine sediment deposited in streams can alter stream channel morphology, substrate composition, and surface-ground water interaction (Madison 1981; Bjerklie and LaPerriere 1985; Rosgen 1996). These changes can lead to decreased survival of fish in the egg and alevin stages; decreased density, biomass, and diversity of aquatic insects; and decreased primary production (Cordone and Kelley 1961; Cooper 1965; Van Nieuwenhuyse 1983; Webber and Post 1985; Lloyd and others 1987; Buhl and Hamiltion 1990).

Suction dredging has been shown to locally reduce benthic (bottom dwelling) invertebrates (Thomas 1985; Harvey 1986) and cause mortality to early life stages of fish due to entrainment by the dredging equipment (Griffith and Andrews 1981). Suction dredging may also destabilize spawning and incubation habitat, remove large roughness elements such as boulders and woody debris that are important for forming pool habitat and that can govern the location and deposition of spawning gravels (Harvey and Lisle 1998). Suction dredging may also increase suspended sediment, decreasing the feeding efficiency of sight-feeding fish (Barrett and others 1992), reduce living space by depositing fine sediment (Harvey 1986), and cause fish to avoid certain habitats because of their response to divers (Roelofs 1983).

On the other hand, suction dredging may temporarily improve physical fish habitat by creating deep pools or by creating more living space by stacking large unembedded substrate (Harvey and Lisle 1998). In general, invertebrates and periphyton all rapidly recolonize small patches of new or disturbed substrate in streams so long as the area of disturbance is not so widespread as to limit the number of organisms available to recolonize (Griffith and Andrews 1981; Thomas 1985; Harvey 1986). In addition, dredge tailings may increase spawning sites in streams lacking spawning gravel or streams that are armored by substrate too large to be moved by fish (Kondolf and others 1991). In some cases the reduction in the feeding efficiency of fish may be offset by reduced visibility and the corresponding reduced risk of predation at moderate levels of suspended sediment (Gregory 1993).

The current state of knowledge of suction dredging and its impacts on aquatic resources suggests that the practice could be either detrimental or beneficial, depending on site-specific use by aquatic organisms and physical habitat limitations. In either case, evaluation of the location and timing of suction dredging is necessary to determine potential impacts on fish and other aquatic resources.

Water Quality and Quantity Impacts. Water pollution from acid rock drainage is generally considered the most serious and persistent problem facing the mining industry. Acid rock drainage can result from the exposure of material containing metallic sulfides such as pyrite, saphalerite, and galena to water and air. The chemical reaction that produces acid rock drainage occurs naturally due to weathering, but mining can accelerate the reaction by exposing large amounts of sulfide-bearing material. When exposed, these sulfide minerals readily oxidize in water to form sulfuric acid. Runoff and seepage from sulfide-bearing material may have a low pH (2.0-4.5), which is directly toxic to most forms of aquatic life and mobilizes toxic metals. The toxic metals can be carried many miles from their source (Johns and Moore 1985). Although testing methods used to predict acid rock drainage have improved in recent years, there is often substantial uncertainty about the predictions, and new mines can develop unpredicted acid rock drainage after only a few years of operation or after mine closure (EPA 1997).

Acid rock drainage from both abandoned and active mines has damaged many miles of aquatic habitat. On Forest Service land alone, an estimated 5,000 to 10,000 miles of stream have been impaired by acid rock drainage (EPA 1997). Metal mining materials and wastes that have the potential to generate acid rock drainage include spent ore from heap and dump leach operations, tailings, waste rock, and overburden. Equally or more important at some sites are the pit walls at surface mining operations and the underground workings of underground mines. Acid rock drainage can also occur in lakes formed by pit mining.

In Nevada over the next 20 years mining is predicted to form 30 pit lakes. When filled by ground water, these lakes will contain more than 1 million acre-feet of water that one researcher predicts will likely be permanently toxic to wildlife (Miller and others 1996).The potential threat to aquatic life from contaminants mobilizing in a pit lake or in ground water next to a pit lake can vary from site to site. Common rates of ground water movement are 150-200 feet per year in fine to medium sands and 1,000-2,000 feet per year in gravels. The actual ground water flow rate depends on the hydraulic conductivity of the aquifer and the ground water gradient. Contaminants such as metals may travel at slower rates than ground water depending on the constituent and its interaction with the soil type (Grabert 1998). In addition, hydrodynamic dispersion, which spreads the contaminate plume in a direction perpendicular to the flow, will affect how big the plume becomes.

Metals are naturally present in all surface waters and are required by aquatic organisms in trace amounts. Mining may cause the concentration of dissolved metals to exceed the natural background levels within streams and lakes. The chief metals released to streams and lakes by mining operations are arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, and zinc. At high concentrations, metals may kill aquatic organisms. At prolonged exposure to sublethal concentrations of metals, organisms may experience behavioral changes and reproductive failure (Chapman 1973).

Cyanide is toxic in its free form, hydrogen cyanide (HCN), as the cyanide ion (CN-), and as breakdown compounds such as cyanates, thiocyanates, chloroamines, cyanogen chloride, and metal-cyanide complexes (Moran 1998). Although free cyanide does not persist in the natural environment and does not bioaccumulate through the food chain, many of the breakdown complexes do bioaccumulate, and some are especially toxic to fish. Consequently, exposure to cyanide compounds resulting from accidental discharge, emergency releases, leaching, seepage, and runoff to surface waters can be harmful or lethal to aquatic life.

Since the 1980s, many major cyanide spills have occurred. On the Zortman-Landusky operation in Montana, cyanide has been detected in every sample of ground water collected between 1992 and 1995 from Montana Gulch. The cyanide contamination at this location was attributed to a pipeline rupture below a leach pad in 1992 (BLM and Montana Dept. of Environmental Quality 1996). The most notable cyanide spill occurred in South Carolina in 1990, when a dam failure released 10 million gallons of cyanide solution, causing fish kills for 50 miles downstream from the mine (EPA 1997).

Many native fish have evolved according to specific patterns of annual and seasonal precipitation, runoff, and stream flow. Most of these species have enough flexibility in the timing of their maturation, migration, and reproduction life stages to allow them to survive temporary periods of unfavorable conditions. Mining, however, can change the natural surface and subsurface hydrology to such an extent that some species cannot survive.

Surface mining commonly results in land that is stripped of vegetation and topsoil. Such a condition can lead to decreased water infiltration capacity of the remaining soils, increased overland flow, decreased lag time between precipitation events and runoff , and consequently increased streamflow over short periods of time. Any increase in overland flow, particularly over disturbed areas, will increase the amount of sediment introduced into a stream. The increased overland flow and sediment input places hydrological stresses on the receiving stream channel and will eventually lead to erosion, destabilization, and enlargement of the stream channel.

Because surface and ground water are inextricably connected, dewatering of aquifers by large open pit mines can influence surface flow patterns. As the amount of water being intercepted and pumped from the mine increases, the size of the area subjected to a lowered water table increases. In some cases the area influenced by dewatering can extend for miles (Crompton 1995). As a result, flow to surrounding springs, streams, and lakes may be reduced or lost with direct consequences to aquatic species that rely on the affected water source. After mining (and pumping) is complete, many decades may be needed for the ground water to replenish (EPA 1997). In some cases more than a century may be required to reestablish the ground water supply to that of predisturbance condition (Manning 1994; BLM 1996d). In other cases dewatering of alluvial aquifers can result in the permanent loss of water storage capacity due to compaction of the aquifer (EPA 1997).

Reclamation Practices. Reclamation under the 3809 regulations has evolved since 1981. In the early 1980s placer mine reclamation usually consisted of relocating the stream channel back into the lowest part of the valley on a bedrock substrate, followed by recontouring the tailings into the surrounding topography by pushing them uphill away from the stream channel and floodplain. Any topsoil that was available was respread over the graded tailings. Many of the sites had been mined previously or historically and the topsoil lost. Occasionally sites were seeded after the topsoil was applied, but more commonly the sites were left to revegetate through natural succession. Similarly, nonplacer operations were often reclaimed by limited grading and occasional seeding.

Today, more attention is paid to stream channel design. In some of the more recent examples of placer reclamation, newly built stream channels are modeled after the natural system or a system with similar gradient, sinuosity, dimensions, and flow. Revegetation is still usually left to natural processes, especially in Alaska. In nonplacer reclamation, seeding is now standard practice, and seeds are usually a mixture of grasses, forbs, and shrubs, and increasingly consist of mostly or entirely native species.

Unfortunately, the success of the existing regulations at rehabilitating aquatic habitat has been poor. The poor rate of success is due mainly to past reclamation practices. Much of the recent emphasis on proper stream channel design has been applied only at a few mines and has yet to be evaluated. In addition, past reclamation practices did not commonly replace lost instream cover components or hard structural elements that provide habitat diversity. Many of these elements (e.g. logs, boulders, root wads) are not suitable for all channel types (Rosgen 1996) and may create unwanted hydrological stress on new stream channels resulting in undesirable channel adjustments. Several years may be needed for a new channel to reestablish equilibrium and stability and allow lost cover components to be installed and habitat diversity to be restored.

Most of the aquatic habitat disturbed since 1981 remains in an impaired condition. Field evaluations by BLM staff and Carlson and Karle (1997) reveal that reclamation, including reestablishing hydrologically stable drainages, properly functioning floodplains and riparian zones, and a diverse mix of habitat types and cover components, has rarely been achieved. In recent years, maintaining good water quality has been less of a problem. But during periods of heavy precipitation or runoff, aquatic organisms may be exposed to harmful or fatal levels of sediment, turbidity, metals, and other toxic chemicals.

Environmental Consequences

Alternative 1: No Action

Under the No Action Alternative an estimated 520 miles of stream habitat would be lost or degraded over the 20-year analysis period due to placer mining. This equates to an average annual disturbance of 26 miles/year. Some of this disturbance would be in areas previously or historically mined. Additionally, other types of mining would continue to affect aquatic habitat, both on and offsite, due to water quality and quantity problems. But this disturbance could not be quantified.

The removal of streamside riparian-wetland vegetation during mining would result in loss or degradation of aquatic habitat until proper functioning condition could be reestablished. In general, the time required for riparian-wetland areas to attain proper functioning condition would be dictated by natural processes and could require from 25 to 50 or more years, depending on site conditions including soil, aspect, climate, and external disturbance factors such as livestock grazing.

Dewatering of mines could expose aquatic organisms to artificially elevated levels of stream discharge during mine operation and insufficient stream flow during aquifer recharge following mining. Water quality standards should be met during periods of low flow, but increased sedimentation and elevated turbidity would be expected during storm events due to stream channel erosion and lack of stabilizing vegetation on disturbed sites. Runoff, seepage, and ground water contamination from spent ore from heap and dump leach operations, tailings, waste rock, overburden material, pit walls, pit lakes, and underground mine workings would continue to threaten aquatic life because of the need for long-term or perpetual water treatment and maintenance of impoundment facilities.

Suction dredging might affect fish communities by reducing local food supply (invertebrates) and feeding efficiency; entraining early life stages of fish; and destabilizing spawning, incubation, and rearing habitat. These impacts would continue, undetected and unregulated, because this activity is considered casual use.

Threatened and endangered species would be protected under the Endangered Species Act, but as with more common species, BLM- and state-listed sensitive species would continue to be displaced, injured, and killed.

Alternative 2: State Management

Under the State Management Alternative the overall level of placer mining is predicted to increase by 5% over the 20-year analysis period. Because of the slight increase in mining activity, the estimated amount of stream channel disturbance would be 530 miles or 27 miles/yr. As under Alternative 1, some of this disturbance would be in areas previously or historically mined, and other types of mining (besides placer) would continue to affect aquatic habitat, both on and offsite. The amount of this disturbance could not be measured.

Impacts to aquatic habitats and communities would vary by state because of the wide range of regulatory requirements. For example, California has a highly detailed and complex regulatory system that recommends that wildlife habitat be returned to its premining condition, if not a better condition, unless the proposed end use precludes habitat. In addition, California requires the preparing of an environmental impact report (EIR) for any project that might have a substantial impact on the environment. The EIR is similar to the environmental analysis and documentation required under the National Environmental Policy Act (NEPA). In contrast, Nevada, defers to BLM reclamation standards and does not require the preparation of any NEPA-like documentation. Regardless of the states' regulatory requirements, the requirements under which a mine is operated are mainly determined by negotiation between the mine operator and the state (McElfish and others 1996). In general, the nature, extent, and duration of impacts under the State Management Alternative would be similar to Alternative 1.

As under Alternative 1, common species and BLM- and state-listed sensitive species would continue to be displaced, injured, or killed except for possibly in California and Oregon, which require consultation for state-listed species.

Alternative 3: Proposed Action

Under the Proposed Action the overall level of placer mining is predicted to decrease by 5% or less from present levels over the 20-year analysis period. On the basis of this level of mining activity, the estimated of stream channel disturbance would be 500 miles or 23 miles/yr.

In addition to the slight reduction in stream channel disturbance due to the predicted decrease in mining activity, the proposed action would require operators to minimize disturbance to fish and many of the habitat parameters affecting the aquatic community, such as water quality, quantity, and riparian areas. This requirement should result in less aquatic habitat being directly disturbed in areas outside the ore body. In the past, areas outside the ore body may have been disturbed to develop access, waste dumps, or other support activities for ore extraction. Where disturbance could not be avoided, the nature and duration of disturbance would be similar to that under Alternatives 1 and 2.

Some of the unavoidable disturbance to aquatic habitat would be offset by riparian-wetland mitigation. Because of the ability of BLM to set the time frame (goal) for riparian recovery (and thus the level of reclamation effort applied to riparian restoration) the time needed to rehabilitate aquatic habitat to a level where it is healthy, properly functioning, and self-maintaining may be slightly less than in Alternatives 1 or 2. Over time, offsite riparian mitigation or replacement required under the Proposed Action should avoid the loss of riparian vegetation but still may not address the spacial distribution and functional processes provided by natural riparian systems (Pastor and Johnston 1992; NCSU 1998).

Suction dredging would continue to affect fish communities by reducing local food supply (invertebrates) and feeding efficiency. But most impacts of the entrainment of early life stages of fish and destabilizing of spawning, incubation, and rearing habitat could be avoided or reduced by proper timing or specifying certain areas as off limits to dredging.

Threatened and endangered species would continue to receive the same level of protection that they do now under the Endangered Species Act. Displacement, injury, and mortality of common and BLM- and state-listed sensitive species should be less in areas where habitat disturbance outside of the area of the ore body could be minimized, such as relocating access roads out of riparian-wetland areas. Sensitive species would continue to be affected near the ore body.

Alternative 4: Maximum Protection

Under Alternative 4 the level of placer mining is predicted to decrease by 10 to 15% over the 20-year analysis period. As a result about 450 miles of stream channel would be disturbed, which equates to 23 miles/yr. But because of the irreparable harm standard and the habitat restoration time requirement, disturbance could be substantially less than this estimate.

In general, the nature of impacts to aquatic resources under Alternative 4 would be similar to that under all other alternatives, but the duration and extent of the impacts could be greatly reduced by the habitat restoration time requirement (and the corresponding increase in reclamation effort needed to meet this time requirement). As under the other alternatives, the removal of streamside riparian vegetation during mining would degrade aquatic habitat and affect aquatic communities by increasing stream channel erosion and stream sedimentation, promoting altered channel morphology, and decreasing water quality. In addition, the role of riparian vegetation in providing nutrient and energy input, stream shading, instream cover components, streambank stability, and aquifer recharge would be lost. But if successful restoration of aquatic and riparian-wetland habitat to proper functioning condition (including suitable water supply) were not projected to occur within 10 years after mining, the proposal to mine could be denied.

In addition to restoring riparian-wetland areas to proper functioning condition, offsite riparian mitigation or replacement would be required at a ratio of 1.5 acres restored to 1 acre disturbed. The increased replacement-to-loss ratio would help offset the temporal, spacial, and functional loss of recreation in riparian-wetland areas.

Runoff , seepage, and ground water contamination from mining would no longer pose as great a threat to the aquatic community because of the ability to designate certain acid-producing deposits as unsuitable for mining. The result would be that acid-producing conditions would not occur in some areas, and metals would not be released into ground or surface water that accompanies low-pH conditions. In some instances, however, the potential for a deposit to produce acid (and metals) would not be foreseen or predicted through modeling.

Impacts from suction dredging would be similar to those under Alternative 3 and for the most part would be avoided.

Under Alternative 4, displacement, injury, and mortality of BLM- and state-listed sensitive species would be reduced or avoided because of the requirement to treat them as threatened and endangered species under the Endangered Species Act.

Cumulative and Residual Impacts

Unavoidable direct disturbance to aquatic and riparian habitat would require many years (25-50+) to rehabilitate to healthy functioning condition. Therefore, most of the habitat disturbed during the 20-year analysis period would be additive to that lost in the past. Some of the mining, especially placer mining, might take place on previously worked claims, resulting in setting back aquatic/riparian habitat recovery by the number of years between the previous and future disturbance.

In summary, an estimated 450 miles of direct stream channel disturbance occurred between 1981 and 1997 due to placer mining, and a similar amount of placer mining disturbance is predicted for the 20-year analysis period. In addition, direct and indirect disturbance to aquatic habitat from exploration; strip, pit, or underground mining; or independent mill sites could substantially increase this estimate, possibly doubling it. The result would be an estimated total cumulative disturbance of 1,500-2,000 miles of aquatic habitat in addition to the thousands of miles of aquatic habitat still being affected by historic operations.

All alternatives might have residual impacts from operations causing acid production, and might result in the associated need to treat water and maintain impoundment facilities for long periods, or perpetually. In addition, erosion, the altering of surface hydrology, and the introducing of sediment beyond the ability of streams to transport it would result in channel instability and undesirable channel adjustments that might affect streams over much of their length. Channel adjustments, in turn, could degrade offsite aquatic habitat.

Wildlife Resources

Affected Environment

A great diversity of aquatic (amphibians) and terrestrial animal species inhabit federally managed public lands. Equally diverse are the vegetative communities that serve as habitat for these unique assemblages of aquatic and terrestrial species. Federal lands across the West provide seasonal or permanent habitat for more than 3,000 species of amphibians, reptiles, birds, mammals, and fish.

Amphibians and Reptiles

Information on the distribution and abundance of amphibians on BLM-managed lands is limited. Amphibians are difficult to survey because localized populations fluctuate widely over time and trends are difficult to determine. Moreover, distribution and abundance are tied closely to specific substrates and microhabitat conditions. Most amphibians require moist sites or standing to flowing water for egg-laying and larval development. Amphibians mainly live in riparian, wetland, and aquatic habitats, but a few inhabit grasslands and coniferous-deciduous forests.

Amphibian populations have declined in the past decade (Vitt and others 1990). Although no single factor has been found to cause declines, many factors are suspected. The dramatic loss of wetlands to land development and farming has directly affected amphibians. The introduction of exotic species such as bullfrogs, trout, and carp can reduce amphibian populations through predation or destruction of food and breeding habitat. Some species have a high tolerance for changes in water quality; others, such as the Idaho giant salamander, do not. Increased sedimentation from mining, farming, forestry, and recreation; runoff from roads; and the use of herbicides and pesticides may alter water quality enough to harm adults, reproduction, and food sources (Freda and others 1991; Quigley and others 1997).

As with amphibians, information is limited on population distribution and abundance of reptiles on BLM-managed lands. Like amphibians, reptiles are closely tied to specific microhabitat conditions, such as slope and aspect.

Appendix F includes a list of species that have been designated by BLM state offices as BLM-defined sensitive species. As stated in BLM Instruction Memorandum 97-118, Guidance on Special Status Species Management, state directors are responsible for designating BLM sensitive species.

Birds

The Migratory Bird Treaty Act of 1918 as amended in 1972 makes it unlawful to "take" any migratory bird, any part of a bird, or nests and eggs of such birds (see Appendix C). The Bald Eagle Protection Act also makes it unlawful to "take" any bald or golden eagle, any part, or nests and eggs of such birds.

Song Birds and Upland Game Birds. In recent years public concern for these birds has risen sharply as a result of population declines. Rich and Beardmore (1997) list 177 species of birds that rated a priority for management attention in one or more of the Western states (Appendix F). Federal lands in the western United States constitute an important part of breeding habitat. Survey data have revealed declines in songbird populations throughout the United States, Canada, and Mexico. Population declines are due to a variety of factors. The main cause is habitat destruction on breeding grounds, wintering areas, and migration routes. But other significant factors include urbanization, habitat fragmentation, predation by domestic cats, parasitism by brown-headed cowbirds, collision with transmission towers and windows, invasions of nonnative plant species, and the use of herbicides and pesticides.

Songbirds that breed on public lands can be classified as short-distance migrants, residents, or long-distance (neotropical) migrants. Short-distance migrants may move only slightly, such as shifting elevation. For example, white-breasted nuthatches, mountain chickadees, and American dippers move down in elevation during winter and return to higher elevations in the spring and summer. Other species such as the northern mockingbird, rufous-crowned sparrow, and downy woodpecker may migrate south but remain within the United States during the winter. Resident birds generally remain in one area during the year and do not migrate. The hairy woodpecker, common flicker, horned lark, and black-capped chickadees are examples of residents.

Neotropical migratory birds travel to Central America, South America, the Caribbean, and Mexico during the fall to spend the winter. They then return to the United States and Canada during the spring to breed. Neotropical migratory songbirds are some of the most beautiful and commonly recognized birds in the United States. Riparian areas and large tracts of upland native prairie are especially important to songbirds. Some familiar species of migratory birds in the West include the Bullock's oriole, western tanager, rufous hummingbird, lazuli bunting, cedar waxwing, and yellow warbler.

A variety of upland game birds also inhabit public lands. Several are becoming imperiled: sage grouse, Columbian sharp-tailed grouse, mountain quail, and lesser prairie-chicken. Other upland game birds on BLM-managed lands include the ruffed grouse, blue grouse, greater prairie-chicken, California and Gambel's quail, willow and white-tailed ptarmigan, several dove species, and wild turkeys. Ring-necked pheasants and chukar partridge are both exotic upland game birds introduced from Eurasia.

Upland game birds occupy many different plant communities managed by BLM. Sage grouse occupy habitats that are predominantly sagebrush steppe. Sharp-tailed grouse prefer a prairie or low-shrub and grass community. Ruffed grouse use brushy woodlands along streams and around springs. Their daily and seasonal habitat needs are typically more specific. Brood rearing requires wet meadow habitats and other habitat types that are ideal for producing forbs and insects.

Nationally, populations of greater prairie chickens, Alaskan sharp-tailed grouse, and wild turkeys are increasing. The remaining species are almost evenly split between stable and declining status. Although weather plays a major role in the population dynamics of upland game birds, urbanization and industrialization have eliminated millions of acres of habitat. Farming, grazing, logging, fire, mineral and energy development, and nonnative plant invasions have all contributed to the loss of habitat.

Waterfowl. Waterfowl include ducks, geese, and swans. Most waterfowl breed in Canada, Alaska, and the northern United States and migrate to overwinter in the southern United States and Mexico. A complex of diverse wetland habitat types that include a variety of emergent vegetation and open water areas are important for reproductive success and survival of waterfowl.

Regardless of the habitat type, extensive areas of habitat have deteriorated or been destroyed and rendered unsuitable for waterfowl. Many waterfowl species have suffered as a result of shrinking habitats, exacerbated by long periods of drought combined with predation. Habitat losses have concentrated waterfowl populations and contributed to the rapid spread of mortality from diseases such as avian cholera and botulism.

Water quality affects the aquatic food chain and has major effects on waterfowl productivity. For example, increasing wetland acidity reduces both emergent vegetation and invertebrate diversity and biomass.

Shorebirds and Wetland-Dependent Migratory Birds. Shorebirds are found not only in coastal regions but throughout the Great Plains and deserts of the western United States—areas that have high evapotranspiration rates. Most shorebirds nest on the arctic tundra, including millions of pairs on public lands in Alaska. Shorebirds generally nest in upland grasses or gravelly areas near semipermanent to permanent wetlands. Shorebirds feed on invertebrates using mudflats exposed by receding water. Common shorebirds include sandpipers, plovers, killdeer, herons and egrets, phalaropes, avocets, rails, dowitchers, and willets. Loons, coots, and grebes require permanent wetland habitats. As with waterfowl, wetlands are important to the future populations of these species.

Raptors. Eagles, hawks, falcons, owls, and vultures are collectively known as raptors, or birds of prey. Compared to most other animal groups, raptors naturally exist at relatively low population levels and are widely dispersed within their habitats. Like the wolf, mountain lion, and grizzly bear, for example, raptors are top predators and represent key species for determining the condition of a variety of ecosystems. Changes in raptor status typically reflect the availability of their prey species (mammals, birds, reptiles). Population changes also may suggest environmental conditions.

Raptors are a subgroup of land birds (see above) but have a couple of special considerations. First, they are more sensitive to disturbances around their nests than are other landbirds because raptor territories are large and their populations are much smaller than those other landbirds. Second, raptors are susceptible to direct mortality through both electrocution and shooting.

Small Mammals

Small mammals (rodents and insectivores) inhabit almost every kind of habitat in North America. Some species, such as deer mice, are common and widespread in many habitats. Others are found only in certain parts of the country or in limited, specific habitats. Beaver are a habitat-limited species because they require riparian or other aquatic communities. Rodents and insectivores are a major source of food for such predators as bobcat, coyote, fox, and badger, and are ecologically important to plant communities. Land uses that threaten one small-mammal species may benefit another.

Bats

Although information on bat species and populations on BLM-managed lands is limited, general studies and surveys are quickly filling this void. The involvement of Bat Conservation International through an agreement with BLM (March 1993) has significantly increased the knowledge base.

Bat populations are declining throughout the United States as a result of deforestation, agricultural development, and human disturbance of caves. Although people generally associate bats with caves, bats may occupy a variety of habitats, including trees and cliffs. Many bats have occupied abandoned underground mines, which often provide microhabitats similar to caves.

Declines in bats pose serious ecological and economic impacts. Bats are the main predators of vast numbers of nocturnal insects, which include many agricultural and forest pests. Bats are also important pollinators and seed dispersers for southwest desert plants. Recently, the Western Bat Working Group (1998) developed a matrix of regional priority species (Appendix F) to give states, provinces, federal land management agencies, and interested organizations better information on the overall status of bat species in western North America.

Carnivores

Populations of large carnivores are decreasing (Weber and Rabinowitz 1996; Clark and others 1996a, 1996b; Noss and others 1996). Large carnivores such as grizzly bears, gray wolves, mountain lions, wolverines, and coyotes are some of the most persecuted of all North American wildlife. Large carnivores have large home ranges and require large prey populations. Therefore, they require large, intact ecosystems to meet their general habitat requirements. One land development action, like clear cutting or a housing development, may only slightly affect a large-carnivore population, but the cumulative effects of multiple actions can be extremely harmful.

Carnivores can be either habitat generalists or habitat specialists. Larger species tend to use a variety of habitats. For example, mountain lion, coyote, black bear, and grizzly bear (habitat generalists) are tied to the movements of ungulates, berry production, and spawning runs of fish, and are, therefore, better adapted to changing environments (habitats). American martens and fishers (habitat-limited carnivores) require late-successional coniferous forests. River otter and mink depend on riparian habitats.

Predator populations are known to increase and decrease in response to prey availability. For example, a lynx's diet consists mainly of snowshoe hares. Snowshoe hares have a 9-10 year cycle. Consequently, lynx populations peak every 9-10 years with a lag year between the time that hare populations decline and lynx realize the declines. The relationship of prey base availability to carnivore populations is one of delicate balance.

Ungulates

Federal public lands are home to millions of big game animals, including large grazers such as elk, moose, mule deer, white-tailed deer, bison, bighorn sheep, woodland and barren-ground caribou, pronghorn antelope, and mountain goats. These native ungulates are important for recreation and subsistence hunting, as prey for large carnivores, and as a reliable source of carrion for scavengers. Like other wildlife, wild ungulates are affected by natural disturbances and human activities.

Threatened, Endangered, and Candidate Species

Economic growth and development by a growing human population have depleted the habitat of many species to the extent that they are threatened with extinction. Enacted to conserve threatened and endangered species and the ecosystems on which they depend, the Endangered Species Act of 1973 (Appendix C) separates species into listing categories. The categories in use today are endangered, threatened, proposed, and candidate.

Endangered species are species in danger of extinction throughout all or a significant portion of their range. Threatened species are those likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Proposed species are those for which a proposed rule to list as endangered or threatened has been published in the Federal Register. Candidate species are taxa for which the U.S. Fish and Wildlife Service or the National Marine Fisheries Service has on file enough information on biological vulnerability and threats to support issuing a proposed rule to list but where further action is precluded by higher priority listing. To date, about 163 species of animals listed as federally endangered, threatened, proposed, or candidate species inhabit BLM-managed lands (Table 3-21).

In addition to species listed under the Endangered Species Act, many state wildlife agencies have their own lists of threatened, endangered, or sensitive species. Through policy, BLM manages public lands to conserve federal and state-listed species. Furthermore, BLM state directors are responsible for establishing lists of special status species that occur on public land and for carrying out programs and actions that conserve special status species and prevent the need to list them as threatened or endangered under the Endangered Species Act.

According to BLM policy, approved land use must not contribute to the need to list species as threatened or endangered. Species proposed for federal listing as threatened or endangered and proposed critical habitat are to be managed with the same level of protection provided for threatened and endangered species, but formal consultations are not required.

Effects of Mining on Wildlife

Habitat Loss. Habitat loss is one of the main threats to maintaining wildlife diversity and species richness (Wilcove and others 1998; Fahrig 1997; Soule 1986). All mining results in the loss of habitat. Mining causes short- and long-term impacts to nesting, forage, thermal, and migration cover on mining sites until the acres of disturbed habitat are returned to a condition suitable to a particular species and life stage.

Ireland and others (1994) studied the

Table 3-21. Numbers of Federally Endangered, Threatened, Proposed, or Candidate Animal Species on BLM-managed Lands

	Endangered	Threatened	Proposed Endangered	Proposed Threatened	Candidate	Total
Amphibians	3	1	0	0	5	9
Birds	16	13	0	0	1	30
Crustaceans	3	1	1	0	0	5
Insects	4	5	1	1	2	13
Mammals	36	4	2	1	4	47
Reptiles	4	12	1	1	0	18
Snails	19	3	4	3	12	41
Total	85	39	9	6	24	163

recolonization of wildlife on a coal strip mine in northwest New Mexico and reported that some habitat that existed before mining was being replaced by reclamation practices on the Pittsburg and Midway Coal Mining Company's McKinley Mine. Wildlife species selected for study in the newly created habitat included amphibians, reptiles, small mammals, and arthropods. Vegetative composition and the presence of rocks were determined to be important components for some wildlife species, particularly habitat specialists. Slow regeneration of pinyon and juniper may have excluded some species for decades after mining. Although the study was conducted on a coal mine, similar results would be expected for other surface mining.

Several species of waterfowl are apt to occur in any given area or habitat. Because most of these species have distributions that are wide relative to any single mining activity, single actions are generally not likely to noticeably reduce their populations. But the cumulative impact of multiple mines could have significant effects, especially if those impacts occur in isolated geographic areas and vegetation types that are population sources for a given species.

Actual or potential degradation of any riparian or wetland area is a serious concern for shorebirds and other wetland-dependent migratory birds, even on a site no larger than a few acres. Even more so than for waterfowl, shorebirds tend to form large aggregations during spring and fall migration. At these times, significant proportions of entire populations may be in one small area (e.g. on only a few acres), where they are vulnerable to adverse impacts such as contaminated soil or water. Locations used by migratory flocks may vary from year to year depending on local, regional, and national climatic fluctuations. Large numbers of birds might unexpectedly visit any site with the proper general characteristics.

Mining's destruction of the wetland habitats of waterfowl, shorebirds, and wetland-dependent migratory birds can and are being mitigated to an extent by creating mine-associated wetlands. In a study of emergent wetlands on surface coal mines in Illinois, Horstman and others (1998) and McKinstry and Anderson (1994) reported that mine-associated wetlands with persistent hydrology and large expanses of emergent vegetation may provide habitat to compensate for the loss of natural wetlands.

According to Braun (1998), the development of open pit mines harms sage grouse numbers and habitats in the short term, but several studies (Montana, Wyoming, Colorado) found some recovery of sage grouse populations after the initial development through the completion of reclamation (Eng and others 1979; Tate and others 1979; Colenso and others 1980; Scott and Zimmerman 1984, Braun 1986). Despite this positive note, Braun (1998) stated that there is no evidence to date that suggests sage grouse populations attain their previous size. A population may need 20-30 years to reestablish.

Call (1979) observed that destruction of raptor habitat from mineral development included nest sites, roost sites, and primary feeding areas. Measures for mitigating loss of raptor habitat have included creating artificial nests, relocating nests, and the retaining highwalls created by mining as new habitat (Postovit and Postovit 1987; Holthuijzen and others 1990).

Abandoned underground mines have become key year-round resources for bats. Due to the colonial nature of most bats, bats are especially vulnerable to the altering or closing of old mines. Loss of a single mine hibernation site can affect a multistate region, eliminating many summer colonies of bats over thousands of square miles. Contemporary mines are usually in historic mining districts and can have major effects on bats. New sampling methods, such as drilling, may detect ore deposits missed by previous miners, and the ore is typically extracted by open pit mining. Open pit mining often destroy existing adits and shafts. Even exploratory drilling can have a major impact on bats if it collapses mine entrances or underground workings (Tuttle and Taylor 1994; Idaho State Conservation Effort 1995).

BLM's recent commitment to protecting

bats and their habitat was demonstrated during a recent Plan of Operations amendment at the Marigold Mine project near Battle Mountain, Nevada. The Plan amendment review revealed that potential impacts to bat habitat were likely (JBR Environmental Consultants, Inc. 1997). A later survey found five species of bats using old mine workings. Three were BLM-listed sensitive species. A mitigation plan was developed. The plan required the company to avoid the impact altogether, minimize impacts by conducting temporary exclusion, and designate more existing habitat for rehabilitation and protection by installing protective gates.

Direct loss of habitat for big game, including both ungulates and carnivores, is an important issue when examining the impacts of surface mining. Habitat loss translates into a loss of forage and protective cover for animals. Ungulates, in particular, are closely tied to three basic habitats: summer range (calving areas), winter range, and migration corridors (Kuck 1986). The affect of habitat losses was demonstrated by habitat losses/alterations at a southeast Colorado military training area. Shaw and Diersing (1990) noted that pinyon-juniper and shrub vegetation densities were significantly reduced following military training. Grass species composition also shifted from perennial to annual vegetation, and the amount of bare ground increased. Stephenson and others (1996) found that mule deer movements were influenced by these habitat alterations.

Several authors have proposed management recommendations to reduce the effects of mining on big game and large carnivores: (1) minimize loss of habitat at mine sites; (2) avoid impacts to migration corridors; (3) protect critical habitats, such as wintering and calving areas; and (4) decrease harvests by reducing encounters between wildlife and humans (Kuck 1986; Merrill and others 1994). Where mining facilities are built, it is recommended that covered corridors, travel fences, and underpasses and overpasses be installed to facilitate movement through the mine site (Merrill and others 1994; Noss and others 1996).

Habitat Fragmentation. Habitat becomes fragmented when a large expanse of habitat is transformed into a number of smaller patches. Two components of habitat fragmentation are (1) reduction in total habitat area and (2) redistribution of the remaining area into disjunct fragments (which mainly affect dispersal and immigration rates) (Wilcove and others 1986; Fahrig and Merriam 1994; McCarthy and others 1997). Fragmentation threatens the stability and persistence of wild populations because the size and isolation of remaining habitats increase the probability of extinction through demographic, environmental, or genetic randomness (Wolff and others 1997).

Sage grouse and other sagebrush obligate species are finicky toward habitat alterations because they so heavily depend on sagebrush. Fragmentation of habitat harms sage grouse if large openings (fragmented habitats) are created during mining. Braun (1998) found that openings larger than 150-200 meters would generally preclude use by sage grouse because they prefer to forage within 100-50 meters of escape cover. The environmental consequences of mining may be mitigated in part by mechanically treating alternative areas to provide suitable brood habitat on summer ranges.

Habitat fragmentation from mining includes the building of roads and structures. Roads directly and indirectly affect wildlife by impeding horizontal and vertical migration or dispersal, subdividing populations that were previously connected, and increasing edge habitat (Young 1994). Road placement and design are key elements to address for protecting and conserving wildlife and associated habitats. Braun (in press) reported that important sage grouse habitat has not been considered in establishing many roads (for mining and other uses) and that, therefore, roads commonly transect brood habitat, winter habitat, and migration corridors. Increased traffic may increase wildlife deaths. Roads also increase disturbance caused by human presence and activities. Highly visible wildlife species would be more vulnerable to harvest and harassment (Cole and others 1997; Stussy and others 1994).

Edge Effects. The creation of edges—the interface between adjoining plant community types—benefits some wildlife species, but these tend to be widespread and common species that are adapted to human activity. Many species are not adapted to edge habitats, and some are harmed. Road-edge habitats are "hard-edged"compared to natural edges, which tend to be "soft-edged." Natural edges are less well defined, with vegetation types merging gradually from one community type to the other. But road edges tend to be abrupt, long-term, and more often disturbed. Road building increases air pollution, soil erosion, noise, direct vehicular fatalities, disturbance by human activities, and exotic species introductions. When combined, these factors create deleterious habitat situations for many native species (Reed and others 1996).

Brown-headed cowbirds provide a good example of how one species may benefit and another be harmed by the creation of edge habitat. These birds are brood parasites that lay their eggs in the nests of other "host" species. Cowbirds prefer edge habitats such as woodland edges (Lowther 1993). They have experienced a large expansion in range due to the creation of more edge habitats with road building and other habitat fragmenting. Cowbirds can seriously reduce the reproductive success of other species, particularly those that already have small populations (willow flycatcher, black-capped vireo, least Bell's vireo). Predators that benefit from human activity (e.g. raccoons, coyotes, blue jays, crows, opossums, and feral cats) also tend to use edge habitats as foraging areas and often have a large adverse impact on bird populations (Robinson 1992; Robinson and others 1995; Robinson and others in press).

Stress and other Disturbance Factors. Disturbance may physiologically and physically stress wildlife (Gabrielsen and Smith 1995). Ultimately, these responses may lead to increased mortality and decreased reproduction (Stephenson and others 1996). Two time periods are critical for many bird and mammal species: the immediate postnatal period in mammals and the breeding period in birds.

Noise. Mining inherently creates noise. Noise affects wildlife in a generally negative way (Shaw 1978). Signal detection would be reduced in areas in which human-generated noise is likely to interfere with acoustical signaling by wildlife (Shaw 1978). Disturbance may elicit physiological and physical responses in wildlife, as may the disturbance caused by noise (Gabrielsen and Smith 1995). But some wildlife species adapt to noise over time.

Potential impacts of disturbance to nesting raptors include nest desertion, damage to eggs or young caused by frightened adults, overexposure of eggs or young to heat or cold, missed feedings, and premature fledgling of young (Fyfe and Olendorf 1976). Call (1979) reported that frequent disturbance by mining can cause bald eagles to abandon their winter roosts or prevent them from using important feeding areas. The results of several raptor studies point to interspecific and intraspecific response differences, as well as differences by type of activity, season of year, and closeness to the disturbance (Bednarz 1984; Ramakka 1988; Holthuijzen and others 1990). A variety of techniques have been employed to avoid or mitigate potential impacts to raptors (Ramakka 1988). Common recommendations include temporal restrictions of activities, selective road closures, or buffer zones around nests and roosts to avoid nest abandonment.

Bats are extremely vulnerable to disturbance. Entry to a winter bat roost during hibernation can trigger premature arousal and the depletion of fat reserves needed for winter survival. The disturbance of a maternity colony can cause mothers to abandon their young. The importance of such abandonment becomes apparent when considering that bats typically have one young per year. If an entire maternity colony is abandoned, the year's crop of young for that particular population would be lost (Brown and Berry 1991).

Mining on or next to water sources used by bats may impair the foraging abilities of bats. Bats use echolocation to find prey and maneuver. Mackey and Barclay (1989) examined the influence of physical clutter and noise on the activity of bats over water.

Responses of bats varied by species, but the overall results suggested that both clutter and the increased background noise of running water reduce the activity of some bats by making the detection and capture of prey more difficult.

Responses of wild ungulates to disturbance, including the use of heavy equipment, vehicles, or human activities, may vary from subtle to extreme panic. Disturbance, therefore, may interfere with health, growth, and reproductive fitness of individual ungulates (Freddy and others 1986).

MacArthur and others (1982) examined cardiac and behavioral responses of mountain sheep to human disturbances (people afoot, people with dogs, different approach paths, road traffic, and air traffic) at the Sheep River Wildlife Sanctuary in southwest Alberta. A person approaching sheep with a leashed dog elicited the greatest response. Canids are the traditional predators of sheep, and it is not surprising that a dog would evoke an increased heart rate. Sheep also responded to the approach of humans from unexpected directions. Few reactions to road traffic were noted. MacArthur and others (1982) concluded that these mountain sheep were partially habituated to humans as a result of human visitation to the sanctuary but premised that sheep in less habituated populations would exhibit increased cardiac and behavioral responses.

Stephenson and others (1996) examined the response of mule deer movements to military activity. Mule deer increased their home range size in response to military training. Geist (1978) observed that animals in a largely predictable environment have a low reactivity to disturbances. Deer on the military site probably exhibited greater response to disturbance because training exercises were more random and unpredictable and tanks and other tactical vehicles were not restricted to roads. Freddy and others (1986) found that mule deer were more disturbed by persons on foot than by vehicles (snowmobiles). Responses to humans were longer and involved running more often, resulting in greater energy expenditure. As one would predict, mule deer response depended on the closeness of the disturbance to the deer.

Kuck and others (1985) examined the response of elk to simulated mine disturbance in Idaho. Elk calves subject to human disturbance and simulated mine noises showed significant responses by altering habitat use and movement. Elk responded to levels of disturbance by interposing topographic barriers between themselves and the disturbance. The increased energy costs of movements, escape, and stress caused by these frequent and unpredictable disturbances may be detrimental to elk calves. A serious consequence of persistent disturbance would be withdrawal of animals to marginal habitats where survival and productivity would be expected to diminish. Extrapolating from these studies, ungulates within the study area would be highly likely to respond similarly to mining. The mitigation measures discussed under habitat loss and fragmentation would help reduce the effects of mining-related disturbance.

Introduced Species. Introduced (exotic) species evolved elsewhere and have been transported and purposefully or accidentally disseminated by humans. These species disrupt the functioning of native ecosystems. Most exotics become pests by rapidly dispersing into communities in which they have not evolved and by displacing native species (Li 1995). Many noxious weeds thrive in disturbed areas where they may out compete native vegetation, resulting in monocultures of invasive species (Soule 1990). When established, weeds may destroy thousands of acres of valuable wildlife habitat, making an area unsuitable for habitat-specific species.

Pollution. A variety of studies examined toxicity levels of cyanide on wildlife (Clark and Hothem 1991; Henny and others 1994a, 1994b; Blus and others 1993, 1995). In one study of cyanide extraction in gold mines in three states (AZ, CA, NV), rodents and bats respectively accounted for 35% and 34% of total mortality. Ten mammal species that are endangered, threatened, rare, protected, or species of special concern (lesser long-nosed bat, long-tongued bat, spotted bat, pika, Mojave ground squirrel, wolverine, California leaf-nosed bat, Townsend's big-eared bat, pocketed free-tailed bat, and badger) were documented mortalities (Clark and Hothem 1991).

Before the existing 3809 regulations were implemented, toxic concentrations of sodium cyanide, free cyanide, and metal cyanide complexes were readily accessible to a variety of wildlife. Wildlife died where cyanide solutions were open, such as in storage ponds, puddles on top of heaps, or flows in channels along the base of a heap to a pond. Most of the mortality was thought to be an acute response to ingestion of free or metal-bound cyanide, but inhalation and exposure to the skin were more important to aquatic species.

Since the 3809 regulations have been in effect, many studies have focused on the effects of heap leach solutions and mill tailing ponds on migratory birds. Birds are especially vulnerable during migration, when large populations are concentrated on limited habitat. This vulnerability was demonstrated in 1988, when 1,459 migratory birds were killed at a gold mine (FWS 1990).

Nevada reported that during the mid-1980s more than 9,500 birds, mammals, reptiles, and amphibians were found dead at mill tailings ponds and heap leach operations (Henny and others 1994b); 91% of the deaths consisted of birds, mainly waterfowl, shorebirds, and gulls. In 1989 Nevada passed a Wildlife Law that developed a program through its artificial pond permit program to require industry to report wildlife mortalities and to protect these resources. More recently, wildlife mortalities at mine sites in Nevada have decreased dramatically, from over 2,000 individual animals in 1986 to just over 300 in 1993 and 1997 (Molini 1998). To break these numbers down even further, less than 50% of these mortalities in 1997 were caused by contact with permitted facilities (cyanide ponds or the nets and fences that cover them) (Molini 1998). A nearly four fold decrease in the number of bird mortalities has been estimated for the 7-year period (Molini 1998).

Historic mining and smelting in Kellogg-Smelterville, Idaho, resulted in high concentrations of lead in sediments along the Coeur d'Alene River. These contaminated sediments continue to harm wildlife today (Henny and others 1994a). American kestrels and northern harriers in contaminated waters downstream from Kellogg-Smelterville contained significantly higher levels of lead in the blood than those of birds in study reference sites above the smelter and mine activity. Although raptor species were found to have evidence of exposure to lead, no raptors deaths related to lead were observed.

In another study (Blus and others 1995) documenting historic mine and smelter sites in northern Idaho, the blood and tissues of passerine birds and waterfowl were found to have high lead levels that originated mainly from mining and smelting. Blus and others (1993) examined wood ducks downstream from a mining and smelting complex in Idaho but within contaminated waters and found that lead levels in blood and tissues of most birds exceeded levels considered to be hazardous to birds.

Mine operators have begun to apply methods of protecting vertebrates from mine water poisoning by using netting and plastic sheeting, applying dilution techniques to reduce cyanide concentrations, and making collection channels inaccessible to wildlife (Canter and others 1991; Henny and others 1994b). In a letter from the Nevada Division of Wildlife (Molini 1998) to "Interested Party," wildlife mortality data show a substantial decline in all categories of animals except for a small increase in the number of waterfowl. The letter goes on to state, "Overall, wildlife mortalities associated with permitted facilities were down to the second lowest level recorded in the past ten years, 185 individuals." Although proven techniques exist for mitigating impacts to wildlife, some mines continue to use less effective techniques such as hazing, noise makers, and colored flagging (Clark and Hothem 1991).

Transmission Lines. Transmission lines for mining may both benefit and harm wildlife. Transmission lines may benefit raptor species by providing roost sites, nest sites, and prey surveillance. Conversely, these same transmission line poles may kill raptors through electrocutions and collisions (Bevanger 1994; Faanes 1987). The following avian groups have been represented in counts of dead birds due to electrocution and collision: waterfowl, gulls, cranes, shorebirds, rails and coots, cormorants, blackbirds, grebes, grouse, pelicans, raptors, doves, herons, woodpeckers, and other passerine birds. Although none of the mortality was considered to be biologically significant (Faanes 1987), the cumulative effects of mortality may be important to populations of rare or endangered species.

Bevanger (1994) reviewed published reports on transmission lines. Storks, falcons, owls, and passerine birds were the most often reported victims of electrocution. Cranes, pelicans, storks, and grouse were reported in excessive numbers as collision victims. Bevanger also points out that, although information is lacking to show that utility structures are a significant cause of death, transmission lines are a serious cause of mortality for some listed species (whooping crane, peregrine falcon, Mexican spotted owl, northern spotted owl, brown pelican, wood stork). The above studies did not state whether these transmission lines were for mining but are simply compilations of reported mortalities.

Netcher (1998) estimated that only about half of mines have transmission lines. For mines with transmission lines a variety of mitigation measures can be used to reduce electrocutions, including new power pole designs and modifications (Postovit and Postovit 1987). Three categories of modifications can mitigate powerline impacts: (1) designing and modifying poles, crossarms, and conductor placement to adequately separate energized parts; (2) insulating wires and other hardware where separation is impossible; and (3) managing raptor perching.

In addition to collisions and electrocutions, wildlife may be harmed by raptor use of utility structures for hunting. Sage grouse are heavily affected by raptor predation. Braun (1998) reported that sage grouse numbers and use increase as distance from the powerlines increase.

State Wildlife Protection Statutes

According to the Center for Wildlife Law and the Defenders of Wildlife (1998), state endangered species act provisions exist in 9 of the 11 study area states (see Appendix D). Utah and Wyoming are the exceptions, but they both have provisions for protecting wildlife. For the nine states with endangered species laws, all are dated between 1969 and 1976. California and New Mexico are the only states to require recovery plans. California and Oregon are the only states that require consultation for state-listed species. Despite the efforts of each state, few state acts provide effective programs for protecting threatened and endangered species.

Historically, states were given the role of protecting the wildlife within their borders. State governments have traditionally served as the stewards of wildlife. Today, they retain this responsibility, but the Federal Government has assumed primary responsibility over these resources under its constitutional authorities (Center for Wildlife Law and the Defenders of Wildlife 1998).

Environmental Consequences

Alternative 1: No Action

Disturbance from exploration and mining is expected to continue at about the same level as has been observed in the recent past—12,500 acres per year. Over the next 20 years 250,000 acres of wildlife habitat would be disturbed. This disturbance represents an irretrievable loss of forage and protective cover until the habitat is reestablished. This disturbance might constitute a short-term loss such as an exploration operation that disturbs only a small area with early successional stage vegetation for 2-5 years and completes exploration and reclamation within 1 or 2 years. Or this disturbance might constitute a long-term loss where habitat restoration could take 25 or 50 years, or a permanent loss such as an unreclaimed open pit.

The cumulative disturbance of wildlife habitat from mining since 1981 has been estimated at 214,000 acres. About 65,000 acres of that disturbance has been reclaimed. But because native plant species and equivalent successional stages of plant species are generally not required for reclamation, suitable habitat for some wildlife species might be permanently lost. Some wildlife, mainly the more common habitat generalists, might benefit from the new vegetative cover, but species that are ill-adapted to the new vegetation could be permanently displaced.

In general, species that existed before mining would be displaced over the long term. Although the effects of mining on wildlife and wildlife habitat might lack significance on a project-by-project basis, existing regulations, management practices, and policies would continue to result in short-and long-term effects on wildlife and biological diversity. Cumulatively, these effects could result in substantial loss or displacement of wildlife.

The long-term impacts on wildlife, including habitat loss, are hard to precisely estimate for several reasons. The location, extent, and timing of future disturbances are not known. In addition, the existing regulations give BLM and operators latitude in reclamation, including habitat restoration and wildlife protection. For example, pit backfilling is not required. Where backfilling is not required, habitat in the pit area is permanently lost. Another example is the requirement to reestablish vegetative cover as part of reclamation. As part of final reclamation, a suitable vegetative cover must be reestablished. But in Alaska a such vegetative cover is generally not required for reclamation of placer operations. In these situations disturbed lands are allowed to revegetate naturally.

For wildlife protection the existing regulations explicitly protect only migratory birds and species that are federally or state listed as threatened or endangered. One can reasonably assume that impacts to habitat and wildlife would continue at current levels. Less than a third of lands disturbed by mining since 1981 have been reclaimed. The vast majority of those unreclaimed acres are part of active operations and would remain in an unreclaimed state until mining ceases. At the least, 149,000 acres of wildlife habitat would be lost until reclamation is completed and enough time elapses to allow the habitat to become suitable for displaced species. More adaptable species would use the reclaimed area, but this is not an "in kind" restoration of habitat. Whether this matters depends on local distribution of limited habitat. One can reasonably expect that limited protection of nonlisted wildlife and associated habitats might contribute to the need to list more species in the future.

A lack of requirements in the existing regulations forcing timely compliance would result in the continued loss of forage and protective cover that would otherwise have been provided by wildlife habitat. In addition, the existing regulations do not require Notice-level operations to be bonded. Without financial guarantees for Notice-level operations, some operators might abandon their operations without reclaiming them. Since 1981, failure to reclaim has accounted for about two-thirds of all notices of noncompliance. Where sites are not properly reclaimed or reclaimed in a timely manner, wildlife habitat would continue to be lost, fragmented, or otherwise degraded.

Alternative 2: State Management

Under State Management, an expected increase in mineral activity would slightly (5% or less) increase disturbance from exploration and mining over what has been observed in the recent past. About 13,100 acres per year or 262,000 acres over 20 years would be disturbed. As under current management, this disturbance would represent a loss of forage and protective cover for the period that the habitat is not suitable. Depending on the habitat requirements of a species, this could be either a short- or long-term loss.

Except for the slight increase in disturbance, the nature, extent, and duration of the impacts on wildlife and wildlife habitat would likely be similar to those described for No Action. This assumption is based on the following: States generally have reclamation requirements similar to those in the existing 3809 regulations, states already have primary responsibility for wildlife management and protection, federal wildlife protection acts would still apply, and 9 of the 12 states in the study area have statutes that protect endangered species. In addition, although it would not be carrying out regulatory responsibilities for mining, BLM would still have its land managing responsibilities under the Federal Land Policy and Management Act, including wildlife habitat management and protection and subsistence evaluations as required under Title VIII of Alaska National Interest Lands Conservation Act.

Alternative 3: Proposed Action

Under the Proposed Action mineral activities would decrease by up to 5%. This decrease in mining translates into an average surface disturbance of about 11,800 acres per year. Over a 20-year period, 236,000 acres of wildlife habitat would be disturbed, representing a loss of forage and protective cover for the period the habitat is not suitable. Depending on the habitat requirements of a species, this disturbance could represent either a short- or long-term loss.

In addition to reduced disturbance, this alternative includes more stringent reclamation standards for revegetation, which would enhance the reestablishing of wildlife habitat (see the Vegetation Section). Administrative requirements, including financial guarantees and administrative penalties, might also result in more timely compliance by some operators. Specifically, these measures would promote the reestablishing of a viable, diverse habitat in a timely manner.

Mining, however, would continue to have cumulative long- and short-term adverse effects on wildlife and biological diversity. As with the existing regulations, management practices, and policies, the long-term impacts on wildlife, including habitat loss, are hard to precisely estimate. The proposed regulations would continue to give BLM and operators latitude on reclamation and wildlife protection decisions. But that discretion would be more limited than under No Action. Specifically, the proposed regulations would require efforts be taken to minimize the impact of operations on wildlife and wildlife habitat, including riparian-wetland areas. In areas outside of the ore body these proposed provisions would somewhat lessen the loss, fragmentation, and degradation of critical wildlife habitat, and reduce the direct loss of wildlife, especially sensitive species that are not protected under federal or state law. These efforts might reduce the likelihood that nonlisted wildlife would need to be listed in the future.

Alternative 4: Maximum Protection

Disturbance from exploration and mining is expected to decline by as much as 30% for certain type of mining under Alternative 4. Operations would disturb about 9,800 acres of wildlife habitat per year. Over the next 20 years 196,000 acres of wildlife habitat would be disturbed, representing a loss of forage and protective cover for the period that the habitat is not suitable. Depending on the habitat requirements of a species, this could be either a short- or long-term loss.

In addition to less disturbance, Alternative 4 includes provisions to avoid critical habitat and impose more stringent reclamation standards, including specific time frames, which would enhance the reestablishing of wildlife habitat. Administrative requirements, including financial guarantees (full bonding for all operations plus establishing financial instruments for unplanned events) and mandatory administrative penalties would result in more timely compliance by some operators. Specifically, these measure would promote the reestablishing of a viable, diverse habitat in a timely manner, thus reducing the time that habitat would be unsuitable for displaced species.

Mining would continue to have cumulative, long- and short-term adverse effects on wildlife and biological diversity. As with the existing regulations, management practices, and policies, long- term impacts on wildlife, including habitat loss, are hard to precisely estimate. But the environmental performance standards under this alternative would establish stringent reclamation requirements, including time frames and enhanced protection for wildlife. This protection would greatly reduce the flexibility that BLM and operators would have in reclamation and wildlife protection. Specifically, Alternative 4 requires the restoring of native wildlife habitat to proper functioning premining condition within 10 years. If this time frame could not be met, BLM might deny the proposal to mine.

In addition, the displacement, injury, and mortality of sensitive species would be reduced or avoided by the provision to treat sensitive species as though they were threatened or endangered under the Endangered Species Act. This provision would substantially lessen the loss, fragmentation, and degradation of critical wildlife habitat, and reduce the direct loss of wildlife, especially sensitive or ill-adapted species.

Wild Horses and Burros

Affected Environment

The Wild Free-Roaming Horse and Burro Act of 1971 requires wild horses and burros to be managed at proper management levels and prohibits their relocation to areas where they had not lived before 1971. One of the act's goals is to manage populations to create a thriving natural ecological balance on public lands. Proper management levels have not been set for all herd management areas but are estimated to be 23,500 wild horses and 3,600 wild burros. In October 1997 about 37,600 wild horses and 5,400 wild burros inhabited some 200 herd management areas on federal land in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, and Wyoming. Herd management areas with populations exceeding the proper management levels are managed to reduce the population by selective removals, including adoptions, fertility control, natural mortality, and other means.

Normally, wild horses almost exclusively eat grasses. Burros have a more diverse diet of grasses, forbs, and shrubs. Wild horses and burros graze throughout their herd management areas, including upland and riparian areas. They migrate short distances during seasonal movements.

The most critical time of year is in the spring during foaling. The social dynamics of wild horse herds, such as competition between stallions, causes dispersion. Wild burros tend to disperse as water becomes plentiful.

Environmental Consequences

Impacts Common to All Alternatives

Where mining occurs within a herd management area, wild horse and burros might be adversely affected. During periods of active exploration and mining, areas with forage might be reduced and access to some water sources might be restricted. Water supplies might also be reduced by mine dewatering. Increases in noise and vehicular traffic and the presence of humans in these areas might force the herds to move to other areas. Horse and burro sensitivity to such activity would be most acute during spring foaling. Animal and human safety are also concerns, mainly along access roads, where mining occurs in herd management areas.

Alternative 3: Proposed Action

Under Alternative 3 mining would have to comply with provisions of the approved BLM land use plan, providing that compliance does not impair the rights of claimants under the Mining Law. In the foreseeable future, provisions could be added to land use plans to limit the amount, type, or timing of mining in herd management areas. Affected wild horse and burro populations would benefit from limiting use of heavy equipment, drilling, blasting, and truck traffic within herd management areas.

Alternative 4: Maximum Protection

Under Alternative 4 mining would have to comply with provisions of the approved BLM land use plan. In the foreseeable future, provisions could be added to land use plans to limit the amount, type, or timing of mining in herd management areas. Affected wild horse and burro populations would benefit from limiting use of heavy equipment, drilling, blasting, and truck traffic within herd management areas.

Livestock Grazing

Affected Environment

Livestock grazing is one of the major land uses within the study area. BLM administers livestock grazing on federal lands under the authority of the Taylor Grazing Act. Other laws that govern livestock grazing on federal lands include the Bankhead-Jones Farm Tenant Act, National Environmental Policy Act, Federal Land Policy and Management Act, and Public Rangelands Improvement Act. BLM authorizes more than 9.4 million animal unit months (AUMs) of livestock forage on public lands in the study area (excluding Alaska) on 21,600 allotments covering nearly 161 million acres.

Since 1981, about 214,000 acres have been disturbed by mining activities on public lands in the study area. Although it is not known how many AUMs of forage have been lost due to mining since 1981, an estimate can be made using a set of assumptions. Assuming about 20 acres per AUM (161 million acres in allotments divided by 9.4 million AUMs), that all acres in allotments are grazed, and that all acres disturbed by mining previously had livestock grazing, it is estimated that a potential 10,000 AUMs have been irretrievably lost to mining, about 1/10 of 1% of the current number of AUMs authorized. These are restrictive assumptions that greatly overstate the likely actual impact because not all acres in allotments are grazed, not all mining disturbance was previously grazed, and not all disturbance results in loss of AUMs where grazing does occur. Nevertheless, this estimate provides a perspective on the general magnitude of the impact.

Environmental Consequences

Much of the information in the following discussion was derived from the Stone Cabin Mine Final EIS (BLM 1994c). The impacts discussed would be common to all

Impacts on livestock grazing from any of the alternatives could result from direct and indirect displacement of grazing, conflicts with traffic, and blockage of livestock access. These impacts would not generally be attributable to a single mine component but might result from the aggregate of all mine components and associated activities.

Livestock grazing would be directly displaced by the removal of vegetation during mine construction and operations. In addition, a larger area would be affected where mine features are fenced. When mining operations are developed where public-land grazing occurs, permitted use must sometimes be reduced. Under these circumstances, grazing permits and leases are permanently adjusted, as provided for in the grazing management regulations. Generally, these reductions are not restored following reclamation of mining sites.

Mine developments would also directly or indirectly displace rangeland improvements. Fences separating grazing allotments and pastures might be disrupted. Fences would have to be realigned, or new fences, cattle guards, or other devices would be installed to maintain the integrity of allotments, pastures, and ownership during all phases of mining. Without these steps, cattle from various allotments and pastures would mix. Important livestock watering ponds, springs, and devices might also be affected.

Airborne dust would be likely to reduce vegetation productivity and palatability downwind of and immediately next to mine activity centers and travel routes. Most dust generated, however, would settle within fenced areas, reducing impacts on livestock.

Cattle displaced from mine developments would tend to concentrate in other preferred areas, most likely near water sources, including wetland and riparian areas.

Mine traffic is expected to increase, resulting in possible livestock losses and damage to vehicles.

Long-term impacts to grazing include direct displacement by unreclaimed or unsuccessfully reclaimed areas. Additionally, reclaimed acres could not be grazed for several growing seasons until grasses and forbs become established. In some areas grazing would never resume because of permanent changes in topography that could not accommodate livestock. If grazing is reestablished too quickly on these areas, the success of revegetation would be endangered by overgrazing of susceptible young plants. Until vegetation becomes established, these areas would provide only a fraction of the carrying capacity of similar undisturbed areas. Grazing would be further delayed on a portion of the revegetated areas because some revegetation would probably require reseeding to become successful.

Fences and other range improvements would be restored to as close to premining conditions as practicable. Fences around mine features would be removed at some point following reclamation.

With closure and reclamation, all mining activities would cease. Therefore, some grazing may be restored but, depending on the type of mining, would not be restored to previous levels. Therefore, some forage losses would be irreversible.

For the most part, access through mined areas would be enhanced by the presence of mine roads that are reclaimed. This improved access would increase recreational travel through mined areas. Some of the other access roads blocked by mines would also be reopened. New traffic would increase the probability of conflicts between livestock and recreational users. The effects of such conflicts cannot be reliably predicted.

Special Status Areas

Special status areas are lands that BLM has determined to have resources of unique or distinct value. These lands have a variety of designations, depending on the resources present and the authority under which they were designated. Some special status areas are open to mineral activity under the mining law or, if closed, contain mining claims that may have prior rights for mineral development.

Affected Environment

Special status areas having exploration and mining subject to the 3809 regulations include areas of critical environmental concern (ACECs); lands in the California Desert Conservation Area (CDCA) designated as controlled or limited use areas; areas in or designated for potential addition to the National Wild and Scenic Rivers System; areas "closed" to off road vehicle use; and designated wilderness areas.

Resources that contribute to the designation of these areas are diverse. Special status areas may be designated to protect a wide variety of resources, such as sensitive plants, wilderness characteristics, scenic vistas, geothermal features, or American Indian sacred sites. Special status areas may also be designated because of potential hazards such as abandoned mines or hazardous materials. The potentially affected resources in special status areas are some of the most valuable and significant resources found on BLM-managed lands. A comprehensive description of all resources in BLM special status areas would be exhaustive.

As of September 30, 1997, a total of 714 designated areas of critical environmental concern (ACECs) covered about 10.4 million acres of public land managed by BLM (BLM 1998a). Some of these ACECs are closed to activity under the mining law, or are closed but contain mining claims with prior mineral development rights. Other ACECs have been left open to the operation of the mining laws with the 3809 regulations used to manage mineral activity in concert with the ACEC resources.

There are 34 BLM-administered rivers in the National Wild and Scenic Rivers System with more than 2,000 river miles and 951,824 acres under protection (BLM 1998a). Some lands in the system are open for operations under the mining laws or have prior development rights that are subject to the 3809 regulations.

BLM manages 5,251,363 acres of wilderness in the United States (BLM 1998a). These areas are all closed to activity under the mining law, but some areas have mining claims with prior development rights under the mining laws. Mining activities in wilderness areas with prior development rights under the mining laws would be regulated by the 3809 regulations.

Environmental Consequences

Impacts to special status areas would depend on the impact to the particular resource that led to the area's nomination or designation. The discussion of impacts to special status areas presented below considers changes in the definition of what the regulations consider a special status area and any standards the 3809 regulations provide for the resources within special status areas.

Alternative 1: No Action

The existing regulations require operations in the California Desert Conservation Area, wilderness areas, and wild and scenic rivers to meet the statutory level of protection or reclamation required by the establishing act. Impacts from operations in these areas can and have been conditioned to meet these requirements. This provision would continue to prevent impacts to resources in these areas beyond those allowed by the areas' establishing authority and would preserve the resources that supported the areas' special status designation.

The existing regulations do not require a higher standard for resource protection in areas of critical environmental concern (ACECs) or areas closed to off-road vehicles (ORVs). Any mineral activity greater than casual use would continue to require an approved Plan of Operations. The Plan review and approval process would allow mitigation to be designed to protect resources in the special status area. But the performance standard is still based on the requirement to prevent unnecessary or undue degradation. There is no higher standard for environmental protection in these areas similar to areas designated by statute. In the past this has occasionally resulted in impacts to the resources that supported designation of the ACEC or ORV closure. These potential resource conflicts would continue to occur on a site-specific basis. In extreme cases the resources that resulted in the ACEC's designation could be significantly affected.

Alternative 2: State Management

The levels of protection or reclamation required by statute would continue to apply to some special status lands. These requirements would be administered by state regulatory agencies, but enforcing these requirements without BLM review and approval of individual Plans might result in some projects not meeting statutory requirements for resource protection.

Impacts to resources in ACECs or areas closed to ORV use would depend on the efficiency of the state regulatory programs and be highly site specific. Land use or activity plans would guide the states on special values of concern. But without BLM review and approval, the potential is likely to increase for mineral activities to adversely affect resources in these special status areas.

Alternative 3: Proposed Action

The proposed regulations would continue to provide the same level of resource protection to special status areas designated by statute. Expanding the list of special status areas would improve protection of sensitive resources by requiring a Plan of Operations for activity that previously could occur under a Notice. The added review times and analysis requirements would improve protection of these resources.

The proposed performance standards would provide a tie to the land use plans. This tie would result in specific consideration of the resources in special status areas and would likely provide more effective mitigation of potential impacts to these resources.

The potential for environmental impacts to resources in special status areas would be reduced by the proposed regulations because of more stringent performance standards, the Plan review requirements, and the predicted decrease in activity. But the potential remains for these areas to be affected if they are open to mineral activity or if closed but prior development rights are being exercised.

Alternative 4: Maximum Protection

The proposed regulations would protect resources in special status areas designated by statute, and mandatory conformance with land use plans would prevent impacts to BLM-designated special status areas. Land use plans would provide prescriptions to ensure that the resources that led to the special status area designation are not affected. In addition, the requirements to prevent irreparable harm to resources would allow BLM to preclude activities that would affect special status areas and their associated resources.

Recreation

Affected Environment

Public lands are managed for a variety of recreation uses, including hunting, fishing, rock collecting, camping, sightseeing, hiking, winter sports, off-highway vehicle (OHV) use, and many others. Most recreation use depends on the natural and cultural features of the land. Public lands in the study area are renowned for their diverse scenic and visual resources. Generally good air quality and dramatic topography combine to create spectacular vistas. The popularity of scenic and backcountry byways and scenic overlooks illustrates the value and appreciation of scenic quality.

Federal lands have a growing number and diversity of visitors seeking recreation (Cordell and others 1989). On BLM-administered lands during 1996, recorded recreation use exceeded 72 million visitor days. Projections show that these numbers will continue to grow, particularly for camping, sightseeing, hiking, off-road vehicle use, and winter sports (Environmental Resources Assessment Group 1997).

At the same time, access to federal lands is an increasing problem in many western states, particularly where private lands must be crossed to reach federal lands. Access that has been available is being lost where ranches are purchased for recreation and recreation homesites; ranchers lease their land to outfitters and close it to others; or ranchers are attempting to avoid vandalism, litter, or open gates.

Maintenance of recreational resources on federal land is important for "quality-of-life" issues. Research on the effects of participation in outdoor recreation show such benefits as improved physical and mental health, increased self-esteem, an enhanced sense of well-being, and spiritual growth. Participation in outdoor activities can also increase family interaction and foster cohesion. Benefits to communities include increased social solidarity, satisfaction with community life, and increased ethnic and cultural understanding (Cordell and others 1989). The same report also states that some of the major issues facing recreation today include protecting resources and open space, acquiring more land and water to meet anticipated demand, resolving conflicts among diverse users, and addressing the need for more access to outdoor recreation areas.

An inventory of an area's wildland recreational settings based on the physical, social, and managerial attributes of the area is the basis for the recreational opportunity spectrum (ROS). These attributes combine to produce recreation opportunities that have three components: an activity, a resource setting, and an experiential component. On the basis of combinations of these attributes, lands can be characterized by a continuum of recreational opportunity classes, including primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural, and urban.

Primitive settings are characterized by essentially unmodified natural environments; their size and configuration assure remoteness from the sights and sounds of human activity. The use of motorized vehicles and equipment is not permitted except in extreme emergencies, and the user is forced to be self-reliant and expects to see few people.

At the opposite end of the continuum, urban settings are characterized by high levels of human activity and by concentrated development, including developments for recreation opportunities. There are a preponderance of signs and other indications of regulations on user behavior.

The opportunity classes serve as an inventory tool for current recreation conditions and visitor expectations. Because mineral development could lead to changes in these settings, opportunity classes serve as a useful measure to help describe the consequences of such development. (USFS 1990; Montana Dept. of State Lands and others 1992).

Although most of the public lands have not been inventoried using the ROS system, the opportunities on public lands tend to fall toward the more primitive end of the spectrum (including primitive, semiprimitive nonmotorized, semiprimitive motorized, and roaded natural). The activities for which demand is expected to increase over the next 40 years also tend toward the more primitive end of the spectrum (Cordell and others 1989).

The effects of mining on recreation tend to be localized and depend on a variety of factors, including the size and type of mine, the mine's setting, the recreation activities occurring in the area, the experience derived from these activities, and opportunities for similar activities in other nearby areas. Examples of the types of effects that locatable mineral mining development and operations could have on recreation include the following:

- Loss of recreational resources that might lead to displacement of the activity to alternative areas or loss of the ability to engage in the activity.
- Modification of recreation settings leading to changes in recreation experiences due to project-related activities or the presence of project-related facilities.
- Reduced feelings of solitude and remoteness due to the introduction of visual, sound, or other sensory effects from project-related activities that could conflict with recreation use.
- Changed access to the area, which could open the area to some uses and close it to others. For example, mine developments can reduce opportunities for nonmotorized recreation while increasing opportunities for motorized recreation.
- Increased local recreation use due to increases in local population due to mine employment.
- Potential effects to the health of the regional ecosystem and decreased opportunities to use these resources for recreation (BLM and USFS 1997).

Effects of mining on recreation can vary a great deal. The following examples outline potential effects to recreation from different types of mines under the existing regulations. More than 125,000 acres of public lands (of 262 million acres of public lands in the study area) are estimated to be currently disturbed by locatable minerals mining.

Impacts have the potential to be most severe when a large open pit mine is located in an area of high-quality, irreplaceable, recreation. An example of this was the proposed New World Mine, which would have been located northeast of Yellowstone National Park and could have affected the prime recreation experiences in and near the park (BLM and US FS 1997). This mine will not be developed (this project was not on BLM-managed lands), but had the mine been developed, effects could have included the following:

- Changes to the recreation setting, including elimination of recreation at some sites and changing other settings by direct visibility of mining, which would eliminate feelings of remoteness and isolation.
- Changes in access, including new roads, increased traffic management, increased congestion, and blocked traffic.
- Changes in the sensory experience of backcountry users and others who are seeking a natural experience, including more noise, perception of increased congestion and crowding from mining-related traffic, and artificial night lighting.
- Effects to hunting and fishing where wildlife patterns or fishing opportunities might be altered due to mining.

The following examples outline potential effects to recreation from a large open pit mine, a placer mine, and a bentonite strip mine, under the existing regulations. These examples are more representative of the types of impacts that occur from mining on BLM lands.

The Bootstrap Project is an open pit mine in the Carlin Trend area near Elko, Nevada (BLM 1996c; Treiman 1998). Lands in the region provide diverse recreational activities, including fishing, sightseeing, hunting, cross-country skiing, white water rafting, photography, rock collecting, and off-highway vehicle use. The Bootstrap Project is increasing the amount of land disturbed by mining and has resulted in less land available for recreation. In addition, because much of the area next to the mine is being used for exploration, public access has been restricted for safety and security reasons.

The Bootstrap Project area, however, is not intensively used for recreation and does not offer unique recreational opportunities. The region contains large areas of similar land open to the public for dispersed recreation. It is assumed that people can go elsewhere for a similar recreation experience outside the project area. Recreation potential unrelated to mining is also changing in the region. Access to public lands has been restricted where private lands must be crossed to reach the public lands. Many land owners, who allowed unrestricted access in the past, have reacted to increased use and abuse by locking gates on their private lands, thereby restricting access to public lands. Some of the increased use may be the result of users displaced from areas affected by mineral exploration and mining. These losses could make it more difficult to replace the recreation activities lost to mining.

The Birch Creek Placer Mining Final Cumulative Environmental Impact Statement (BLM 1988a, McClain 1998) discusses the potential impacts to recreation from placer mining in the Birch Creek watershed about 70 miles northeast of Fairbanks, Alaska. Birch Creek, a national wild river, is managed as a part of the Steese National Conservation Area. The national wild river offers outstanding recreational opportunities for floatboating for the experienced canoeist and is one of the few clearwater rivers in the state with road access at two points on an otherwise undisturbed river. In addition to floatboating, visitors to the area engage in fishing, hunting, nature study, wildlife observation, wilderness camping, and hiking.

Placer mining has affected recreation in this area in a variety of ways. New mining roads have allowed access to new areas for off-highway vehicle (OHV) use, with some trespass occurring in areas closed to OHVs. Boating and hunting have increased substantially in the past 15 years due mainly to better access. This increased use has reduced the quality of the primitive recreation experience. Degraded water from holding pond breeches and mining claims in the headwaters of Birch Creek during high water events have degraded the recreational experience of float boaters downstream. The water quality during regular and low flows has steadily improved over the past few years, but some mining practices still result in periods of degraded water in medium to low water flows.

The Cody Resource Management Plan/EIS (BLM 1988c; Bye-Jech 1998) addressed the effects of bentonite strip mining on recreation in northwest Wyoming. Before mining, the areas with potential for bentonite development offered limited recreation, including off-road vehicle use and some hunting. Bentonite mining has opened some areas that were previously inaccessible, decreasing opportunities for nonmotorized activities and increasing opportunities for motorized activities, including OHV use. These newly accessible areas have replaced hunting or OHV opportunities that were lost or reduced through mining.

Recreational Mining

Recreational mining includes a variety of activities such as gold panning, using backpack suction dredges and sluice boxes, rock collecting, and other nonmechanized activities. Recreational mining occurs to some degree in most of the western states but is difficult to define because it is based on the motivation of the participant rather than a specific activity. Recreational mining takes many different forms, including a group or as a solitary activity, with or without a mining claim, in BLM-designated areas, or as an occasional activity or a much more frequent one. Because much recreational mining is considered casual use and no contact with BLM is required, the number of people engaging in recreational mining on public lands is not known.

Currently this activity is handled in different ways by field offices. In some areas a recreation permit (not a 3809 authorization) is required to use an area that BLM has specifically developed for recreational use. An example is in northern California where people can rent a site for dredging and sluicing for up to 30 days. For this area about 90 permits are issued annually. In the Medford Field Office area (Oregon), four areas are open to dredging, panning, and sluicing. A free recreation permit is required, and 35 have been issued so far in 1998.

In other areas mining clubs are active and own claims where their members can engage in mining for a fee. In the California Desert, mining clubs stake mining claims and stage mining events. These events might draw as many as 500 people, many of whom engage in dry wash placer mining. Mining club principals submit mining Plans of Operations. In these cases, each person might be engaging in casual use, but the cumulative effects of all the participants cause more than negligible surface disturbance.

In other cases no permits are required even though many people might use an area. At Topaz Mountain, Utah, people come from around the world to collect topaz using hand tools. No permit is required, and the number of collectors is not known.

Environmental Consequences

Alternative 1: No Action

Under No Action locatable minerals mining development would continue to affect recreation user experiences as they have in the past. Examples of the types of impacts from current management are included in the discussion above. These effects would vary a great deal depending upon the resource setting, the current recreation use of the area, the size and type of mine, and opportunities for using alternative areas.

Overall, the mix of recreational opportunities available would change. Primitive recreation opportunities could decrease, while opportunities for more developed recreation could increase. Areas that offer experiences at the more primitive end of the Recreation Opportunity Spectrum continuum would be more vulnerable because mining tends to dominate local settings, potentially eliminating their wildland character. Recreationists who prefer a primitive setting would be faced with a choice of diminished experience, finding an alternative area in which to recreate, or giving up the activity. Mine development, however, could increase the opportunities for some types of recreation by building roads into previously inaccessible areas. Effects to wildlife and streams would continue under No Action and could reduce hunting and fishing opportunities.

Opportunities for recreational mining would continue as they have in the past.

Alternative 2: State Management

Effects under the State Management Alternative would be similar to those under No Action. But the potential for mining-related effects to resources, including water quality, wildlife, and more primitive recreation settings, would be slightly increased, generally due to the increased level of mining activity.

Overall, the mix of recreational opportunities available would change. Primitive recreation opportunities could decrease, while opportunities for more developed recreation could increase. Areas that offer experiences at the more primitive end of the recreation opportunity spectrum (ROS) continuum would be more vulnerable because mining tends to dominate local settings, potentially eliminating their wildland character. Mine development, however, could increase the opportunities for some types of recreation by building roads into previously inaccessible areas. Effects to wildlife and streams would continue under No Action and could reduce hunting and fishing opportunities.

Alternative 3: Proposed Action

Effects under the State Management Alternative would be similar to those under No Action. Overall, the mix of recreational opportunities available would change. Primitive recreation opportunities could decrease while opportunities for more developed recreation could increase. Areas that offer experiences at the more primitive end of the recreation opportunity spectrum continuum would be more vulnerable to mining because mining tends to dominate local settings, potentially eliminating their wildland character. Mine development, however, could increase opportunities for some types of recreation by building roads into previously inaccessible areas. The magnitude of the above changes would be slightly less than under No Action.

But the potential for mining-related effects to resources, including water quality, wildlife, and more primitive recreation settings, would be slightly reduced compared to No Action. This reduction would help maintain existing recreation uses related to fishing and hunting. In addition, visual resources would have more protection than under No Action.

Recreational mining would continue to be handled in different ways by BLM field offices. Under the Proposed Action, land use plans might designate activities that would require either a Notice or Plan of Operations, including requirements for reclamation. In addition, suction dredging may or may not have additional requirements, depending on specific BLM-state agreements (see Chapter 2). The new requirement for some participants to file Notices or Plans of Operations might delay or preclude some recreational mining. The estimated decline in this activity under the Proposed Action would be less than 5%. But once participants become familiar with the new rules, the effect should decrease.

Alternative 4: Maximum Protection

Overall, the mix of recreational opportunities available would change the most under Alternative 4, relative to the other alternatives. Primitive recreation opportunities could decrease, and opportunities for more developed recreation could increase, but at a lower rate. Mine development would increase the opportunities for some types of recreation by building roads into previously inaccessible areas. Areas that offer experiences at the more primitive end of the recreational opportunity spectrum would be more vulnerable to mining development because mining tends to dominate local settings, potentially eliminating their wildland character. Under Alternative 4, however, large open pit mines, which have the greatest potential to affect recreation, would decline more than any other type of activity. The magnitude of the changes in the mix of recreational opportunities would be less than for No Action or the Proposed Action.

To the degree that mining would decline (up to 30% from the current situation, depending upon the type of mining), more opportunities for recreation would be available than under all other alternatives. Increased opportunities could allow for the anticipated increases in demand for the types of recreation activities available on BLM lands. Alternative 4 would reduce the potential for mining-related effects to resources, including water quality and wildlife, and would help maintain existing recreation uses related to fishing and hunting. Both water and wildlife resources, in addition to visual resources, would have more protection than under all other alternatives. But recreation opportunities that would have been created by mine roads providing access into previously inaccessible areas would be forgone.

Recreational mining would continue to be handled in different ways in BLM field offices. Under Alternative 4 all participants would have to contact BLM to determine if their planned activity is casual use or if a Plan of Operations (including reclamation) is required. Requiring all participants to consult BLM and some to file Plans might delay or preclude some recreational mining. Recreational mining would decline by an estimated 5%. Once participants become familiar with the new rules, however, the effect should decrease.

Visual Resources

Affected Environment

As described in the recreation section, public lands in the study area are renowned for their diverse scenic and visual resources. Generally good air quality and dramatic topography combine to create spectacular vistas. The popularity of scenic and backcountry byways and scenic overlooks illustrates the value and appreciation of scenic quality. Scenic values can be tied to America's number one pastime of driving for pleasure.

BLM has a basic stewardship responsibility to identify and protect visual values on public lands. These public lands have a variety of visual values, and these different values warrant different levels of management. Because it is neither desirable nor practical to provide the same level of management for all visual resources, these values must be systematically identified and evaluated.

This evaluation is based upon the apparent visual values of landscapes of similar character as displayed on the map *Physical Divisions of the United States* by Nevin M. Fenneman and the U.S. Geological Survey (Fenneman 1946). Therefore, only landscapes of similar character are ranked against each other, thus eliminating the possibility of entire regions of the country being ranked as low quality scenery when compared to other regions of very high scenic quality.

The visual values are identified through the visual resource management (VRM) inventory and are considered with other resources in the resource management planning (RMP) process. All BLM lands within resource management planning areas are assigned a visual resource management (VRM) class. Class I is assigned to all special areas where a management decision has been made to maintain a natural landscape. This includes wilderness areas, wild sections of wild and scenic rivers, and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape (i.e. wilderness study areas).

Classes II, III, and IV are assigned by a process that considers scenic quality, viewer sensitivity to changes in the landscape, and distance zones (BLM 1986). Scenic quality, a measure of the visual appeal of a tract of land, is determined by using the seven key factors of landform, vegetation, water, color, adjacent scenery, scarcity (uniqueness), and cultural modifications. Sensitivity, a measure of public concern for changes to the scenic quality, considers the types of users, amount of use, public interest, and adjacent land uses. Distance zones are based on the premise that the closer a point in the landscape is to the viewer, the more the details are visible and the greater the visual impact from a surface-disturbing activity. Distance zones examine relative visibility from travel routes or observation points and consider whether something is in the foreground-middleground, background, or seldom seen.

From the above information, BLM-managed areas covered by resource management plans (RMPs) are assigned a management class that represents the relative value of the visual resource and prescribes the level of acceptable change in the landscape. The VRM class objectives are described below.

Class I Objective - **No Visible Change**: The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes but does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II Objective - **Change Visible but Does Not Attract Attention**: The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III Objective - **Change Attracts Attention but Is Not Dominant**: The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV Objective - **Change Is Dominant, but Mitigated**: The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. But every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

BLM policy toward visual resources was recently articulated in Information Bulletin No. 98-135 (BLM 1998b). This policy does not represent a change from current policy but a renewed emphasis on the importance of the program. The Information Bulletin stated that BLM has a basic stewardship responsibility to manage visual resources on public lands. Local management discretion for decisions related to VRM issues is guided by this basic stewardship responsibility and decisions in planning documents. It is BLM policy that visual design considerations be incorporated into all surface-disturbing projects on public lands, regardless of the size or potential visual impact of these projects. The VRM system should not be viewed as a means to preclude development, but rather as a design tool to help management minimize potential visual impacts (BLM 1998b).

Information on the national distribution of BLM lands within the VRM classes is not available. Areas of high mineral potential in mountains, river valleys, or other areas with high scenic values are the types of areas where conflict over scenic values would most likely occur. The effects of locatable mineral mining on visual management objectives for an area depend on a variety of factors, including the size and type of mine, the basic visual elements of the landscape and the proposed project, and the ability to mitigate visual impacts. The following examples outline potential effects to scenic values from two large open pit mines, a placer mine, and a bentonite strip mine, under current conditions.

Impacts to scenic values have the potential to be most severe when a large open pit mine is located in an area of high scenic quality. An example of severe impacts to scenic quality can be seen at the mining development at Zortman, Montana, in the Little Rocky Mountains (BLM and Montana Dept. of Environmental Quality 1996). The Little Rocky Mountains are an isolated area of domed mountains roughly 10 miles in diameter. The rounded crests rise nearly 3,000 feet above the surrounding plains. The topographic relief, colors, and textures of the mountains and their vegetation contrast with the relatively homogeneous terrain, lines, forms, colors and textures of the adjacent plains. In an assessment of the scenic quality of the Little Rocky Mountains, completed in 1979, the area was found to have Class A scenery and was given a Class II VRM rating (BLM and Montana Dept. of Environmental Quality 1996)

Since 1979, disturbance at the Zortman Mine has resulted from open pit mines, heap leach pads, waste rock storage areas, roads, topsoil stockpiles, processing areas, and other ancillary facilities. Mining has caused a major change in landforms, creating sharp contrasts with the lines, forms, colors, and textures visible in the natural landscape. The scale of the disturbance dominates the viewer's attention. These contrasts are visible from many of the surrounding peaks and buttes, which are used by recreationists for hiking, picnicking, and wildlife viewing, and by American Indians for cultural purposes. The current disturbance at the Zortman Mine is incompatible with the objectives for VRM Class II landscapes. Alteration of the topography has caused an irretrievable loss of the area's characteristic landscape.

The Bootstrap Project is an open pit mine in the Carlin Trend area near Elko, Nevada (BLM 1996c; Treiman 1998). This VRM description is taken from the EIS because the mine has been in operation for less than 2 years. The landscape, which is characterized by broad open vistas framed by scattered hills and mountain ranges, has been given a Class IV designation.

The main impact of the mine is large-scale modification of landforms. Angular, blocky forms and horizontal lines have created moderate contrasts with the natural rounded, rolling hills and ridges of the characteristic landscape. Land clearing and construction of waste rock storage and leach facilities have exposed soil and rock in a variety of colors. The visual impacts of new structures are small when compared to the visually dominant waste rock disposal areas and mine pits. Mitigation measures developed to reduce visual contrasts include locating facilities in less visible areas, minimizing disturbance, and repeating the basic elements of form, line, color, and texture. Following successful reclamation, the most noticeable residual effect of the proposed action would be the mine pits.

The Birch Creek Placer Mining Final Cumulative Environmental Impact Statement (BLM 1988a; McClain 1998) discusses the potential visual effects from placer mining in the Birch Creek watershed about 70 miles northeast of Fairbanks, Alaska. Birch Creek, a national wild river, is managed as part of the Steese National Conservation Area. The landforms are defined mainly by the Birch Creek drainage. Lower, rounded mountains and hills, with bedrock intrusions that have been shaped and dissected by flowing water, are the characteristic landforms. The major tributaries of Birch Creek flow through deep, narrow valleys. The Birch Creek National Wild River has been rated as VRM Class I. But past and present activities—such as placer mining, road construction, and other similar activities that have altered the characteristic landscape—are incompatible with Class I objectives. Mining disturbance is reclaimed, but the surface is revegetated by natural processes. Meanwhile, the cumulative impacts continue to increase.

The Cody Resource Management Plan/EIS (BLM 1988c; Bye-Jech 1998) addresses the effects of bentonite strip mining on visual resources. Before mining, the areas with potential for bentonite development received VRM Class III or IV ratings. Visual quality has declined in specific areas due to bentonite mining but still meets VRM class objectives.

Environmental Consequences

Management Common to All Alternatives

All locatable minerals mining would operate under BLM policy that visual design considerations will be incorporated into all surface-disturbing projects on public lands, regardless of the size or potential visual impact of these projects (BLM 1998b).

Alternative 1: No Action

Effects to scenic values under No Action would be similar to those described above. Project-specific impacts would depend upon the size and type of the project, the area's topography, the ability to mitigate effects, and other factors. Some projects still might not meet VRM objectives, especially large open pit mines in areas designated Class I or II. Mining in Class I or II areas could contrast in texture, color, form, and line with the natural landscape. This mining could cause a permanent loss of scenic values and scenic integrity and could negatively affect activities such as tourism and recreation that depend, at least in part, on scenic values. Mining development in areas designated Class III or IV would be more likely to meet objectives because more modification of the landscape is allowed.

Alternative 2: State Management

Under State Management adverse effects to the visual environment could be greater than under No Action. Reclamation efforts would be similar, but less emphasis would be placed on scenic quality. Additionally, this alternative would slightly increase mining, increasing the potential for disturbance to visual resources.

Alternative 3: Proposed Action

Project-specific impacts would depend upon the size and type of the project, the topography of the area, the VRM goals, and the ability to mitigate effects. Overall, the effects to scenic quality would be less than under No Action due to stricter reclamation standards, fewer Plans falling into the casual use category, and slightly less mining activity overall. Some projects, however, might not meet VRM objectives, especially large open pit mines in areas designated as Class I or II.

Alternative 4: Maximum Protection

Project-specific impacts would depend upon the size and type of the project, the area's topography, VRM goals, and the ability to mitigate effects. Overall, the effects to scenic quality would be much less than under No Action or the Proposed Action because of much stricter reclamation standards, including mandatory pit backfilling, better road design, and enhanced revegetation standards. Fewer operations would fall under casual use, and much less mining would occur, especially open pit mines, which tend to have the greatest effect on visual resources. Projects would be more likely to meet VRM objectives because of the lessened effects to the visual environment discussed above and the requirements for projects to conform to BLM land use plans.

Cave Resources

Affected Environment

Caves can be found in any type of rock as a result of a variety of natural forces. Karst features, depressions, sinkholes, caves, or underground drainages are usually found in sedimentary rocks, notably limestone, dolomite, or gypsum. Caves in igneous rock include flow features such as tubes, lava blisters, and fissures created during an eruption. Overhangs and cliff caves may be found in any type of rock. They are usually erosional remnants that can vary in depth and length from a few feet to several hundred feet.

Cave resources are defined in 43 CFR 37.4 as follows:

> "any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the earth or within a cliff or ledge, including any cave resource therein, and which is large enough to permit a person to enter, whether the entrance is excavated or naturally formed. Such term shall include any natural pit, sinkhole, or other feature."

This definition excludes abandoned mine tunnels or other human-made features. The Federal Cave Resources Protection Act of 1988 (FCRPA) provides for the designation of significance based upon the following criteria: biota, cultural, geologic/mineralogic./ paleontonogic, hydrologic, recreational, and educational or scientific values. Upon discovery, the cave is evaluated to determine its significance. If a cave is determined to be significant, its entire extent, including passages not mapped or discovered at the time of determination, is deemed significant.

To date, 510 caves on federal lands have been designated as significant; 25 limestone caves have been withdrawn from mining claim location. At least 30 caves have been affected by mining operations of some kind. At least four of these were significantly affected to the extent that they no longer exist.

Where they exist, state laws protecting cave resources are usually limited to resources on state lands or parks or other resources administered by the state. Few states have laws that protect caves regardless of ownership.

Environmental Consequences

Impacts Common to All Alternatives

Impacts to cave resources are actions that would impair or destroy the caves or any of the characteristics that make them significant. These impacts could directly result from mining if a mine were on or next to a significant cave. Impacts, particularly to caves that contain cultural or paleontological material, are not as likely to occur under Plan-level activity as they are under Notice-level activity because of the environmental review procedures that protect cave resources. In caves near mineral operations, fragile cave formations can be disturbed or dislodged by seismic activity. But these impacts are often difficult to predict.

Other impacts to caves result from increased population and access into areas previously remote as a result of new mines being developed. These indirect impacts are the most common source of damage to cave resources. Indirect impacts can range a considerable distance from a new mine and can include vandalism and inadvertent damage from visitors or collectors.

Studies on the affect of mining to cave resources are limited, but potential effects can be listed. Exploration, particularly drilling, has the potential to breach the fragile cave environment. Disrupting the air or water movement or temperature in a cave affects cave growth and development, speleothem growth, and maintaining a healthy ecosystem for cave wildlife. Any microflora or fauna within the caves have evolved because of the delicate balance between water and air. Any surface- or soil-disturbing activities that either increase or decrease the amount of air or water within a cave would adversely affect the cave system. Changing the water quality or quantity by aquifer disruption or introducing water into an aquifer could also affect the cave environment. Increased soil erosion and siltation could prevent water infiltration into cave systems by normal routes and adversely alter speleothem growth. Additionally, excessive siltation and sediment loads in the underground streams and pools would have highly negative impacts on the aquatic wildlife.

The desirability of these caves for recreational use could decrease and possibly present greater risks to entrants, depending upon the degree in which air and water movements are altered and the amount of blasting and other structural modifications that are created as a result of mining activities.

Other impacts to caves might result from increased visitation and vandalism as a result of improved access to new mines being developed in areas that were previously remote. These indirect impacts can range a considerable distance from a new mine and include inadvertent or intentional damage from visitors or collectors as well as disturbance of bat colonies and other wildlife.

Alternative 1: No Action

Direct impacts are expected to continue to decrease under the No Action Alternative, mainly because of the ongoing implementation of the Cave Resources Protection Act of 1988, an increased awareness of cave resources, and mineral withdrawal of areas with significant caves. Activities occurring under Notices would likely continue to affect cave sites. Indirect impacts from existing and new mines would continue at the same rate or slightly less depending upon the number of new mines, the expansion of existing mines, and the success of withdrawals. These impacts relate to increase human activity in an area; as such they are not easily predictable.

Alternative 2: State Management

State laws protecting cave resources vary. Six western states have statutes that give some protection to cave resources but none to the same extent as the Federal Cave Protection Act. In those states impacts to caves might increase slightly. In the western states without cave regulatory protection, cave resources are likely to see an increase in the adverse affects to cave resources. Where states lack an equivalent National Environmental Policy Act statute, wildlife, cultural, or paleontological values in caves are not likely to be considered, and impacts to caves containing these resources would increase. Indirect impacts from existing and new mines would continue.

Alternative 3: Proposed Action

Specific language in the proposed regulations increases consideration of cave resources. Also, the increased time frame for evaluating significant affects upon resources would benefit cave resources and might prevent both direct and indirect impacts. Specifically, impacts from Notice-level mining would likely be greatly reduced because of these increased time frames for review of Notices by BLM.

Alternative 4: Maximum Protection

Under this alternative, all mineral activity that has the potential to cause disturbance greater than casual use would be a Plan and would be subject to a thorough review by BLM. The elimination of Notices would reduce impacts to all cave resources. Also, greater emphasis upon land use planning documents would further protect caves.

Paleontological Resources

Affected Environment

Paleontological resources are the remains of plants and animals preserved in soils and sedimentary rocks. They are important for understanding past environments, environmental change, and the evolution of life. Paleontological resources can be found in any sedimentary formation or soil deposition context. The highest potential exists in badlands shale, sandstone, limestone outcrops, adjacent fault scarps, and eroded lands.

The Federal Land Policy and Management Act directs agencies to manage paleontological resources to preserve them for scientific and public uses. Paleontological resources have not been systematically inventoried on most BLM-administered lands.

BLM has found 5 million acres of sensitive fossil-bearing geological deposits on western federal land. The fossils range in age from the Precambrian (more than 500 million years ago) to the recent (the last 10,000 years) and include examples of all extinct and living phyla. Paleontological remains include mammoths from the Ice Age, about 10,000 years ago, to the microorganisms that constitute the earliest evidence of life some 2.8 billion years ago. Paleontological remains discovered on federal land include dinosaur remains in Alaska, Nevada, Utah, Colorado, Wyoming, California, and Montana; fossil fish deposits in the Green River Formation of Wyoming; insect and plant fossils in Nevada, large petrified trees in Arizona and Nevada, and recent-age fossils in Alaskan deposits.

Past Impacts

Mineral activities can benefit paleontological research when significant resources are discovered, reported, and recovered as a result of activities ranging from exploration to extraction. The removal of overburden during mining can expose fossil-bearing formations for inspection and possible discovery. Surface-disturbing activities can adversely affect paleontological resources if deposits are not identified or reported and significant fossil information is displaced or lost.

Since 1981 paleontological resources have been involved in no more than 3% of Notice-level activities, mainly in Utah, Montana, and Wyoming. In Alaska the number is higher; 26% of Notices have involved paleontological remains because of the higher proportion of placer mining there. No notices of noncompliance have been issued as a result of damage to paleontological resources.

Paleontological resources have been found during Plan-level activity in most states. New Mexico, Oregon, Washington, Utah, Alaska, and Montana have had paleontological resources discovered from 6 to 10% of the time during mining. In the other states paleontological resources have been found in 1 or 2% of Plan-level operations. In Plan-level activity mitigation measures are used to reduce the impact and prevent loss of information.

Environmental Consequences

Alternative 1: No Action

Impacts to paleontological resources due to Notice-level activity would continue at the present rate of 26% in Alaska, to about 3% of the Notices in the other states. Both adverse and beneficial impacts at the Plan level would also continue at the present rate.

Alternative 2: State Management

Under Alternative 2, paleontological resources might not be identified or reported. Few states have laws for protecting paleontological resources, and most protection is restricted to state land. Depending on the state program, a considerable amount of paleontological resources and associated site information could be lost.

Alternative 3: Proposed Action

Increased protection or preservation of paleontological resources would result from including private surface overlying federal minerals in the types of activities requiring a Plan of Operations. Impacts to paleontological resources from both Notice- and Plan-level activities would be slightly reduced due to the inclusion of sensitive lands in the category of disturbance requiring a Plan of Operations.

The increased time frames for review would allow more extensive examination of areas of proposed disturbance to determine either the existence of fossils or the potential for the area to produce significant fossils. The extended time period for evaluating and recovering fossil resources discovered during surface disturbance would decrease the likelihood of damage to the resource or loss of site data.

Alternative 4: Maximum Protection

The potential for impacts to paleontological resources would be reduced. Paleontological resources on private surface overlying federal minerals would also be inventoried and recovered. Paleontological information would no longer be lost from Notice-level activity since all activity would occur under a Plan.

The increased time frames for Plan review would allow more extensive examination of proposed disturbance areas to determine either the existence of fossil material or the potential for the area to produce significant fossil material. The unlimited time period for the evaluation and recovery of fossils discovered during operations would allow for complete data recovery in areas containing complicated paleontological depositional situations.

Cultural Resources

Affected Environment

Cultural resources are the fragile and nonrenewable remains of human activity. They are found in sites, districts, buildings, and artifacts that are important in past and present human events. Cultural resources are arbitrarily divided into historic and prehistoric cultural properties and traditional lifeway values, although they are part of a continuum of human use and occupation of the land.

A traditional lifeway value is important for maintaining a traditional system of religious belief, cultural practice, or social interaction for a contemporary ethnic or cultural group or community. Shared traditional lifeway values are abstract, nonmaterial, ascribed ideas that cannot be discovered except through discussions with members of the particular group. Lifeway values may or may not be closely associated with narrowly defined locations.

As of 1994, about 5.7% of the BLM-administered lands have had cultural resource inventories conducted. As a result, 171,003 sites have been recorded with 19,297 properties identified as eligible for listing on the National Register of Historic Places. In addition, certain areas have been designated on the basis of, at least in part, their cultural resource content. Table 3-22 shows the numbers of nationally significant designated cultural resource areas.

Prehistoric Resources

Prehistoric properties found in the U.S. extend back to the earliest human migrations to the Western Hemisphere, some 15,000 years ago. Prehistoric properties range from isolated artifacts, through small-scale habitation sites, to complex agricultural villages and densely populated pueblos. Prehistoric human occupations were rarely uniform over large areas, particularly where there were significant ecological changes over short distances. Consequently, site types, sizes, and densities are extremely variable. American Indians typically consider prehistoric resources to be ancestral sites.

Prehistoric cultural resources have been organized into early, middle, and late periods, with the early period commonly called Paleo-Indian (15,000-8,000 years ago), the middle period as Archaic (8,000-2,000 years ago), and the final period as Late Prehistoric (2,000-200 years ago).

Cultural resources from the Paleo-Indian period are found in high-elevation coniferous and deciduous forests and also lower elevation plains grasslands and in parts of the desert Southwest, mainly near water sources and in alluvial and colluvial soil deposits. People during this period often hunted megafauna, such as mammoth and giant bison, which are now extinct.

Prehistoric cultural resources from the Archaic period reflect a shift from an exploitation of megafauna to an emphasis on hunting and collecting a variety of resources, such as fish, large and small game, and edible plants and nuts. Hunting sites, plant gathering sites, and temporary camps are likely scattered in most western ecosystems.

Beginning about 2,000 years ago the Archaic period phased into the Late Prehistoric period with the introduction of agriculture, ceramics, the bow and arrow, and sedentary lifeways as major adaptive elements. In general, site types and patterns were the same as during Archaic times except where lifeways shifted to an agricultural base.

The Prehistoric era began blending into the Historic era in 1492 when Europeans started

Table 3-22. Designated Nationally Significant Cultural Resource Areas

Designation	Number	Estimated Acres
National Historic Trails	22	798,000 (2,494 miles)
National Register Properties Listed	1,034	432,913
National Historic Landmarks	12	117,167
Areas of Critical Environmental Concern	123	1,428,960
Totals	1,191	2,777,040

significant migrations to the Americas. The Historic era began in the Southwest and California in the 1500s with the Spanish *entrada*. In the Pacific Northwest and the Great Basin significant migration effects did not begin before the middle of the 1800s. In the Rocky Mountains and Plains the Historic era did not begin until the exploitation of the region by the fur trade in the late 1700s and early 1800s.

Historic Resources

Cultural properties related to the Historic era continue to include indigenous materials, but the resources are now dominated by artifacts, sites, and landscapes of early Euro-American exploration, the fur trade, mining, logging, ranching, farming, transportation, manufacturing, and urban development.

Beginning about 1900 the Historic era blends into modern times although certain elements of traditional and historic cultures and lifeways are sometimes preserved. For example, American Indians continue traditional religious beliefs and practices and in many cases have maintained tribal uses of traditional plant gathering and hunting. Also, other native Americans retain values, sometimes as an occupation, in the land and its use and accessibility. These "Old West" attitudes are deeply held by the families who have held land and lived for generations in the same area.

Traditional Cultural Resources

Traditional cultural properties and traditional lifeway values include areas for gathering plants, animals, or minerals that are important to American Indians and other cultural groups. They also include areas and landscapes that embody religious symbolism or are required for ritual practices. Rural historic landscapes that exemplify a historic lifeway, such as ranching or mining, may be important. Traditional cultural properties may also have historical significance from events such as battle grounds or other local, regional, or national historic events.

Historic Impacts to Cultural Resources

There are three main sources of impacts to cultural resources. Vandalism to sites includes unauthorized collection, excavation, or defacing and is the most common source of loss of values. Impacts from vandalism increase as population increases and as access to an area improves. It is difficult to measure this type of impact. But where population increases, such as a mine opening, the amount of vandalism generally increases. Loss of site information, material culture or *in situ* information from unauthorized or inadvertent activity, such as a off- road vehicle use and sometimes Notice-level activity, is the second type of impact. Again, measuring this type of impact is difficult, and impacts sometimes go unnoticed for a long time. Finally, previously unknown cultural resources, such as buried material with no surface indication, can be disturbed. Often a large portion of these types of resources can be destroyed before being noticed. If a sufficient amount of this type of resource remains upon discovery by the operator, the recovery of the information would be a net benefit to cultural resources.

Before authorizing surface disturbance, BLM must identify cultural resources eligible for inclusion on the National Register of Historic Places and consider the effects of the proposed undertaking through the consultation process in Section 106 of the National Historic Preservation Act (NHPA) of 1966. This process is implemented according to 36 CFR 800. In many states, procedures for adapting the process to local needs have been developed through programmatic agreements among BLM, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation. Section 106 of NHPA does not prohibit disturbing cultural resources. In fact, BLM may permit activities that result in an adverse effect if mitigation cannot preserve all site information. Often this is the loss contextual information about the site, its existence within a particular ecological zone, or the inability to apply evolving techniques of data recovery. In addition, mitigation is required only if disturbance would affect a resource's attributes that make it eligible for the National Register and may ignore other information. In recent years, with an awareness and appreciation of cultural resources, properties and traditional lifeway values, the inventory, protection, stabilization, and enhancement of cultural resources have become an integral part of BLM procedures. While recovery of cultural resource information results in a loss of some *in situ* information, this loss of information is slight under most mitigative activity.

Notice-level activity is not a federal action or undertaking and therefore does not require consultation under National Historic Protection Act procedures. But to meet the broad management responsibilities for cultural resources under the Federal Land Policy and Management Act, Archeological Resources Protection Act, National Environmental Policy Act, and National Historic Preservation Act, cultural resource specialists routinely review Notices. This involvement ranges from 50% to 100% of the cases. In less than half of the cases, trained nonspecialists have been used to recognize resources for evaluation by specialists.

Cultural resources are disturbed under Notice-level actions, but nationwide only about 3%, on the average, of these actions either require mitigation or actually damage cultural resources. Only 1% of these sites were listed on the National Register of Historic Places. Eight notices of noncompliance have been issued since 1981 for damage to cultural resource sites. Only two of these sites were on the National Register of Historic Places.

The approval of Plan-level activities requires compliance with the National Historic Preservation Act. This process includes review by BLM cultural resource specialists. Generally, on-the-ground inventories are required for all potentially affected areas. Resources discovered during inventories are evaluated to determine their eligibility for inclusion on the National Register of Historic Places and how they would be affected by the Proposed Action.

Since 1981, up to 30% of the Plans of Operations submitted have involved prehistoric resources, and up to 50% have involved historic resources. The notable exception is in Alaska, where 92% of Plans of Operations submitted since 1981 have involved historic resources. All of these sites were evaluated according to existing regulations, and only 10% or fewer were eligible for the National Register of Historic Places. Since 1981 only one notice of noncompliance has been issued for damage to cultural resources.

The beneficial effect of mineral activity has been the addition of information to prehistory and history from the inventory and evaluation of sites in disturbance areas. The major contributions have been from processing of Plans of Operations and, to a lesser extent, Notice reviews. Resources discovered during operations, if recognized in time, can contribute valuable information on cultural resources.

State laws protecting cultural resources vary. Burial laws are common to most states and are usually not specific to prehistoric or historic remains. These laws commonly require the notification of the local coroner should a burial or human remains be discovered. State laws protecting prehistoric or historic sites are normally effective only on state-owned lands. In some cases these laws extend to private land where state or federal funds are involved.

Environmental Consequences

Alternative 1: No Action

Impacts would continue under Notice-level activity. The number of sites affected is expected to stay at the same level, about 3% of all cases. The recovery of site material during mine operations would benefit cultural resources.

Alternative 2: State Management

Mining activity could increase by an estimated 5% under the State Management Alternative. State programs by themselves would generally not provide for mitigation of impacts to cultural resources, or provide for data recovery of disturbed sites. Both the increased potential for disturbance and the lack of data recovery would be a significant negative impact to cultural resources.

Alternative 3: Proposed Action

For several reasons the Proposed Action would reduce impacts to prehistoric, historic, and traditional cultural resources for both Notice- and Plan-level activities. First, fewer Notices and proportionally more Plans would be submitted due to the expansion of special status areas. Overall, a more detailed cultural resource review would result with improved opportunities for identification and mitigation development. As a result, cultural resources would be better protected. Second, the amount of time allowed for the recovery of data from cultural resources discovered during operations would double from 10 to 20 working days. This increased time frame would result in better or at least more complete recovery of data from cultural resource discoveries. Third, the addition of split-estate lands with private surface over federal mineral would, on occasion, allow data recovery and protection of cultural resources on these additional lands.

The amount of mineral activity is expected to decrease slightly from the current levels. While this decrease means a decrease in opportunities for cultural resource inventory and data collection from mineral project sites, it also means less potential to adversely affect cultural resources. These two effects are approximately equal. In areas such as traditional cultural properties, national historic trails, or other areas where the mineral activity disrupts the setting of the historic property, a decrease in mineral activity benefit these cultural resources.

Alternative 4: Maximum Protection

Alternative 4 would give the most protection to cultural resources for several reasons.

First, Notices would be eliminated. All previous Notice-level activity would have to be conducted under Plans of Operations, resulting in more detailed cultural resource reviews with improved opportunities for identification and mitigation development. Cultural resources would be better protected.

Second, the amount of time allowed for the recovery of data from cultural resources discovered during operations would increase from 10 working days to an unlimited time period. This time frame would give sites discovered during mining a sufficiently detailed recovery strategy commensurate with their significance, resulting in improved or at least more complete recovery of data from cultural resource discoveries.

Third, the addition of split-estate lands with private surface over federal minerals, and lands with BLM surface only, would provide an opportunity for data recovery and protection of cultural resources on additional lands.

Also, the amount of mineral activity is expected to decrease from the current levels. While this decrease means a decrease in opportunities for cultural resource inventory and data collection for mineral projects, it also means less potential to harm cultural resources. Since all activity potentially affecting cultural resources could be controlled under Plans of Operations, the decrease in data collection opportunities from sites would outweigh any positive impact from decreased mineral activity.

American Indian Resources

Affected Environment

Public lands managed by BLM are sometimes used by American Indians for a variety of traditional purposes. American Indians may use the lands to gather native plants, animals, and minerals for use in religious ceremonies, rites of passage, folk medicine, subsistence, crafts, and other traditions. Contemporary use areas are often associated with traditional plant and mineral collection locales, vision quest sites, sun dance grounds, shrines, and traditional trails. Lands with a history of traditional use or possessing traditional lifeway values may be eligible for listing on the National Register of Historic Places as a traditional cultural property (TCP).

Due to the combination of geology with topography, lands that are used by American Indians for traditional cultural practices or that contain traditional cultural resources often contain valuable mineral deposits that are the focus of exploration and development. Conflicts over mineral activities in these areas is becoming increasingly common. These lands are often viewed as sacred by individual American Indians. Any disturbance or intrusion in these areas is regarded as desecration that can not be mitigated.

Sometimes the use of the public lands is subject to treaties between the United States and a particular tribe. Treaty rights are often defined from the "canons of treaty construction," that ambiguities must be resolved in favor of the Indians, that treaties must be interpreted as the Indians would have understood them, and that the treaties must be construed liberally in favor of Indians. Since these treaties were signed between sovereign nations, the retained rights have a constitutional basis. These rights may include access to and use of "unoccupied federal land" in the conduct of daily lives, usually for subsistence activities. The exercise of treaty rights would supersede the requirements or procedures found in the 3809 regulations and is outside the scope of the regulations.

Regulatory Statutes and Executive Order 13084

The American Indian Religious Freedom Act of 1978 (AIRFA) and Executive Order 13007 require federal agencies to evaluate their policies and procedures to protect the religious freedom of American Indians. AIRFA was passed as a joint resolution of Congress and has no implementing regulations. The intent of AIRFA is to preserve for the American Indian the inherent freedom to practice traditional religions, including access to religious sites, use and possession of sacred objects, and freedom to worship through traditional ceremonies. In American Indian religious practice, any geographic area can contain places that are significant for sacred practices or purposes. Those sacred places may embody spiritual values of specific landforms, indigenous rock art, medicine wheels, rock cairns, effigy figures, spirit trails and gates, caves, springs or lakes, Indian graves, and contemporary use areas. AIRFA requires agencies to consult with American Indians on religious use of an area but does not give that use controlling authority over other uses.

The Native American Graves Protection and Repatriation Act protects American Indian burial sites and access to them. These sacred sites and associated materials are protected from removal and desecration. These sites may not be generally known but may be discovered through formal inventory , archaeological studies, or inadvertent discoveries.

The trust responsibility between the tribes and the United States has been affirmed by Congress and the U.S. Supreme Court. This doctrine relates to reservation and nonreservation lands where federal or federally authorized activities may affect tribal resources or the quality of life on the reservation.

Executive Order 13084, signed May 14, 1998, requires "regular and meaningful consultation and collaboration with Indian tribal governments in the development of regulatory practices on Federal matters that significantly or uniquely affect their communities; to reduce the imposition of unfunded mandates upon Indian tribal governments; and to streamline the application process for and increase the availability of waivers to Indian tribal governments." Because tribal lands are not defined as "federal lands" in the existing or proposed regulations and because the purpose of the executive order is to reinforce tribal standards rather than impose unfunded mandates on the tribes, the executive order is not likely to affect the applying of the regulations.

The Alaska National Interest Lands Conservation Act (ANILCA) protects Native Alaskan and rural population subsistence activity on public lands. This act provides that the agency consider the affect of its actions on subsistence efforts of these groups. This consideration is applied as agency permit activity on a site-specific basis.

Generally, the states have no regulatory statutes for consulting with federally recognized tribes. States, however, do consult with tribes as they would with the public or a local division of government.

Historic Impacts

Consultation with recognized tribes has been inconsistent in the past. Since the 1980s consultation has become an increasingly important part of authorizing activities and planning.

Although not a federal action, there have been a limited number of consultations on Notice-level activity with tribal governments. The highest level of consultations occurred in New Mexico with 20% of the Notices. There is no record of consultation in 6 of the 11 BLM western states in the study area (not including Alaska). Montana has had about 5% of its Notices either commented on or objected to by tribal governments.

Where BLM has played a definitive role in authorizing activities under a Plan, its consultation with tribes has been more consistent. Since 1990 most BLM states have actively sought comment from tribal governments about Plans of Operations, with an average of 27% of the Plans being submitted for consultation and 4% being amended or changed in response to consultation.

In several cases surface disturbance under Notices or Plans has adversely affected or had the potential to affect localities important to American Indian traditional lifeway values or traditional cultural properties eligible for the National Register of Historic Places. Despite consultation, surface-disturbing activities in certain areas are regarded by some American Indians as desecration. Such disturbance cannot be mitigated to eliminate American Indian objections to the actions.

Few state regulatory programs have mandated consultation on any issues outside the designated reservation on either state or private land.

Subsistence activities, particularly as related to Alaska National Interest Lands Conservation Act (ANILCA), have been addressed in several-site specific placer mining EISs from Alaska: Fortymile River (BLM 1988d), Birch Creek (BLM 1988a), Beaver Creek (BLM 1988b), and Minto Flats (BLM 1988e) EISs. These documents have discussed potential impacts to subsistence activities. In general, placer mining has the potential to impact subsistence uses and needs in the following ways:

1. By reducing potable water quality of a stream used as a source of drinking water;
2. By disturbing or destroying fisheries, animal populations, or habitats that support subsistence fishing, hunting, or trapping;
3. By increasing harvest through creating more or better access routes into an area; and
4. By causing sedimentation of waterways, which impedes human access to subsistence resources.

In each of the EISs mining was determined to have no additional significant restrictions to subsistence activities and that applying performance and reclamation standards, in some cases, would have a net beneficial effect to access and water quality.

Environmental Consequences

Alternative 1: No Action

Consultation with potentially affected parties would continue to improve as a result of recent executive orders and management guidance on BLM's responsibility to the tribes. Tribal governments would also continue to play a more assertive role in land use planning to protect areas of traditional cultural importance.

Despite complete consultation, some adverse impacts would result to areas of traditional cultural importance. Residual impacts can be expected to continue from both Notice- and Plan-level activity because of the nondiscretionary nature of activities conducted under the Mining Law and the inability to mitigate impacts to American Indian values.

Potential adverse impacts to subsistence rights are expected to continue as in the past (see Historic Impacts from Mining section under Affected Environment above) and would continue to be considered on a site-specific basis.

Alternative 2: State Management

Adverse impacts to American Indian traditional cultural practices and resources are likely to increase under State Management. The level of mineral activity is projected to increase slightly under Alternative 2, and the greater the level of activity, the greater the potential for impacts. More importantly, most states do not have a mandate for consultation, nor do they have a trust responsibility to protect tribal rights. Opportunities would decline for tribes to consult with the permitting authority on mitigating measures that could reduce impacts to their traditional cultural values.

Alaska is not bound by the provisions of the Alaska National Interest Lands Conservation Act (ANILCA) to address impacts to subsistence activities. Exploration or mining could result in more adverse impacts to subsistence activities without applying the provision of ANILCA.

Alternative 3: Proposed Action

Adverse impacts to American Indian traditional cultural practices and resources are likely to decrease. The level of mineral activity is projected to decrease slightly under the Proposed Action because the lower the level of activity, the less the potential for impacts.

Impacts would also decrease because of increased levels of consultation with American Indians. The increase in special status areas and added discretion on when BLM would require Plans of Operations would result in more complete reviews of proposed activity and provide for extended consultation with American Indians.

Even with improved consultation and reduced levels of mineral activity, adverse impacts to areas of traditional cultural importance would not be eliminated. Some residual impacts could be expected to continue from both Notice- and Plan-level activity because of the nondiscretionary nature of activities conducted under the Mining Law and inability to mitigate certain impacts to American Indian values.

Potential impacts to subsistence rights are expected to continue as in the past (see Historic Impacts from Mining section under Affected Environment above) and would continue to be considered on a site-specific basis.

Alternative 4: Maximum Protection

Adverse impacts to American Indian traditional cultural practices and resources would decrease substantially under Maximum Protection. The level of mineral activity is projected to decrease moderately under this alternative, and the lower the level of activity, the less the potential for impacts. Adverse impacts would also decrease because of increased levels of consultation with American Indians. The elimination of Notices would make all activity above casual use subject to the review and consultation requirements of Plans of Operations. This change would result in more complete reviews of proposed activity and provide for extended consultation with American Indians to mitigate impacts.

In addition, concurrence by potentially affected American Indians would be required before BLM could approve surface disturbance on lands with traditional cultural importance, or lands used for traditional cultural practices. This requirement would greatly reduce adverse impacts to American Indian traditional cultural practices and resources. Nevertheless, some residual impacts would continue because some people would be reluctant to disclose or discuss areas of importance with "outsiders." Notice- and Plan-level activity.

The inclusion of split-estate lands under the 3809 regulations would give American Indians more opportunity to consult and mitigate impacts where in the past surface ownership has prevented such consultation or rendered it moot.

Potential adverse impacts to subsistence rights are expected to continue as in the past (see Historic Impacts from Mining section under Affected Environment above) and would continue to be considered on a site-specific basis.

Social Conditions

Affected Environment

Demographic and Social Trends in the West

In 1996, the population of the 12 western states in the study area was 57.3 million. While these 12 states contain nearly half of the area of the United States, they are home to only 22% of the Nation's population. California has the largest population with more than 31 million residents. Alaska, Montana, and Wyoming each have fewer than a million people. Population densities vary from fewer than 5 people per square mile in Wyoming to more than 200 people per square mile in California. Though the area's population grew by 11% between 1990 and 1996, individual states varied. Nevada and Arizona were the fastest growing states, increasing by 33% and 21% respectively. California and Wyoming grew the slowest at 7% and 6% respectively.

In the rural West, population and social trends tend to respond to unique issues. Many areas are experiencing a significant increase in population after decades of stability or decline. Other rural areas continue to lose population due in part to the outmigration of young people who leave for advanced education, military service, and employment. Still other rural areas are subject to the population and employment boom-and-bust cycles of mining and other resource development.

The movement of people and jobs into some rural areas began in the 1970s and is expected to continue into the 21st century. The migration turn-around reflects a reversal of the rural-to-urban migration pattern found in most of the United States before the 1970s. Intermountain valleys, the settings for such places as Salmon, Idaho, and Missoula, Montana, typically experience inmigration. In scenic areas, particularly those suitable for recreation, ranches are being sold for recreation uses or subdivided for homes. Some inmigrants buy small lots to ranch or farm but do not depend on an economic return from the property. These rural areas are moving from a long-term economic dependency on agriculture, logging, or mining to a dependency on recreation and tourism. This population inmigration has increased contacts between long-time rural residents and newcomers whose beliefs and values may challenge the existing way of life. Long-timers may feel they have lost control of their community, making it a less desirable place for them to live.

Other rural areas have continued to lose residents in the last decade. These communities typically have had economies based on agriculture, logging, oil and gas, or other mineral development and have suffered declines in population as agriculture mechanized and mineral development efforts came and went (boomed and busted). Some of these communities have difficulty maintaining their local businesses as well as such services as schools and health care. Residents are concerned about the economic survival of their communities and preserving their traditional lifestyles. While these communities can be located in many regions of the study area, many of them are located on the western edge of the Great Plains in central and eastern Montana and Wyoming.

Major cities in the West— Denver, Seattle, Phoenix, Salt Lake City, San Francisco, and Los Angeles—have experienced significant growth over the last few decades. These urban centers are often the areas where environmental attitudes are most pronounced and many environmental groups have headquarters.

National Attitudes

Discussions about changes in the 3809 mining regulations are just one aspect of a broader debate on environmental issues and resource management that is occurring both in American society and globally. According to the report of the Forest Ecosystem Management

Assessment Team (FEMAT) (1993), "This growing concern with the environment, from the international to local levels, appears linked to some fundamental structural changes taking place in industrialized societies. Shifts in education levels, population distribution, and composition and make-up of the labor force all combine to bring increased concern with issues related to the quality of life and other types of personal attitudes, including natural resources and the environment."

According to Stankey and Clark (1991), social values for lands and natural resources take many forms:

- Commodity values: timber, range forage, minerals
- Amenity values: lifestyle, scenery, wildlife, nature
- Environmental quality values: air, water quality
- Ecological values: habitat conservation, sustainability, threatened and endangered species, biodiversity
- Public use values: subsistence, recreation, tourism
- Spiritual values: sacred places, wilderness areas
- Health: medicines
- Security: sense of social continuity and heritage

In the past, natural resource management has tended to emphasize commodity values. The emerging emphasis on other values has forced a reevaluation of the commodity emphasis. Stankey and Clark's (1991) report states, "A new focus on the part of the public involved a shift from commodities and services to environments and habitats." More profoundly, these changing value orientations within society have led to changing expectations concerning the management of public lands.

A nationwide survey conducted by Roper Starch Worldwide (1997) offers some interesting information on attitudes toward environmental issues and regulations. When asked what was the leading environmental issue we face today, pollution was named by 60%, with 41% of these respondents specifying air pollution and 29% specifying water pollution. Sixty-five percent of the survey respondents said that environmental protection and economic development can go hand and hand. But nearly 70% said that when a compromise cannot be reached, they would choose the environment, while 15% would choose economic development.

Respondents to this survey were also asked whether they thought environmental laws and regulations had gone too far, had not gone far enough, or had achieved the right balance. Almost three times as many respondents thought laws and regulations had not gone far enough (46%) as those who thought laws and regulations had gone too far (17%). Just over a quarter of the respondents (27%) thought the laws had struck the right balance; 29% of respondents living in rural areas and 27% of respondents living in the West stated that environmental regulation had gone too far.

When asked the same question as above but about specific issues, 72% of the respondents stated that laws and regulations had not gone far enough to prevent water pollution. The same figures for other issues were preventing air pollution 62%, protecting wild or natural areas 48%, protecting wetlands 44% and protecting endangered plants and animals 41%.

Miners

This section will focus on small "mom and pop" type operations (up to three or four people) that function without outside financial backing. These operations may engage in exploration or small placer, open pit, or underground mines although they are most likely to engage in exploration or placer mining. Most of this activity operates as casual use or under a Notice because these operations disturb less than 5 acres. The number of these miners is declining overall, although some new people are entering the field. In some cases several generations of a family work a claim. Some have family members employed outside the mine for more financial support. Many of these miners live a very independent, solitary, self-sufficient lifestyle, especially in Alaska. These miners may also be mechanics, pilots, loggers, and skilled in construction; a variety of skills helps them maintain their independent lifestyle.

Some operations offer large financial rewards; others are marginal. Some miners from Alaska spend the summers mining and the winters in the lower 48 states. In the other 11 states in the study area some people spend their summers in northern states such as Idaho and their winters in places like Arizona working their claims. Little is known about these miners from a sociological standpoint. They do, however, appear to identify highly with their occupation and the lifestyle of that occupation and would resent being forced to change either.

Communities

The effects of mining on a rural community can be divided into four phases: exploration, development, production, and phase down or closure (Wenner 1992). During exploration, the major effects would be increased business volume for motels, restaurants, and gas stations, plus some temporary employment for local residents. During this phase, local residents and special interest groups may become aware of potential mineral development in their vicinity. The intensity of their reaction varies from one project to another depending on factors such as local economic conditions, existing land uses, local lifestyles, outdoor recreation preferences, the ecological sensitivity of the development site, and the way in which the proposed activity is designed and presented to the public. In general, no significant expansion of local facilities and services is necessary for exploration.

Site development is often the most labor-intensive phase of operations and can cause more social impacts than exploration and production because the workforce is larger. Rural counties and communities can be seriously overburdened if the firms involved fail to provide the housing and services their new employees require. The negative consequences of rapid development, such as increased crime rates and increased need for mental health services, are most evident under such conditions.

The production phase is ordinarily the most stable and enduring phase of mineral operation. A major mine may operate continuously for two or three generations. Its presence in a relatively rural area is imposing and influences the social organization, outlook, and lifestyles of nearby communities. The rate of population change is the single most important factor affecting community well-being, contributing to prosperity and infrastructure improvements in some instances and to economic instability, social disorganization and adverse social conditions in others. As time goes on, community facilities expand to accommodate the newcomers, and they become integrated into the community.

A phase down or closure of a large mine can be a traumatic experience, especially for small communities in sparsely populated areas. The loss of well-paid jobs and the resulting outmigration can affect real estate values, the volume of local business activity, school enrollments, organizational membership, and the economic security and outlook of most of the resident population.

Communities come in a variety of forms and sizes, resulting in differing abilities to adapt to change. One study completed for the Interior Columbia Basin Ecosystem Project (Harris and others 1995) categorized communities by a variety of factors and determined the qualities that make a community "resilient" or able to manage change. According to the study, the qualities that allow communities to manage change include the following: strong civic leadership, strong economic structure, high degree of physical amenities, a positive, proactive attitude toward change, and a large population.

Environmental Advocacy Groups

During the scoping period, many letters were received from environmental advocacy groups stating their support for changes in the surface management regulations. Comments from the different groups were similar, and some groups submitted joint comments. These groups believe that substantial environmental damage continues to occur on public lands in the study area from active and abandoned mines and that strengthening the regulations could result in real environmental gains. Specific ideas included strengthening reclamation standards, conducting unannounced inspections, including third-party monitoring with more inspections of high-risk mines such as cyanide heap leach operations, and requiring Notice-level operations to operate under the same regulations as larger mines. Some groups said that BLM should have the authority to deny mining where it is not a suitable use of public lands, such as areas with important water, wildlife, scenic, or recreation resources. According to these groups, mining should also be denied where a mining company cannot demonstrate that a mine site can be reclaimed. Some groups also said that they will continue to work for comprehensive reform of the 1872 Mining Law.

Environmental Consequences

Alternative 1: No Action

Effects to miners of small operations and to communities would continue as they have in the past because mining regulations would not change. Miners on small operations would support this alternative because changes in regulations would not affect their current occupation or lifestyle.

Increasing numbers of people in the West and across the country believe that the surface management regulations should increase emphasis on protecting amenity resources. (See discussion under National Attitudes at the beginning of this section.) Alternative 1 is not consistent with these attitudes.

The environmental advocacy groups who participated in scoping and many of the people associated with these groups would not support current management because they believe it does not sufficiently protect the resources on public lands. The condition of the resources on public lands is important to these people because they value these resources for recreation, wildlife, scenic and spiritual qualities, and a variety of other reasons. Many appreciate just knowing that these areas exist and would continue to exist in the future.

Alternative 2: State Management

Generally effects to miners of small operations and to communities would continue as they have in the past because mining under state regulation would be similar to current management. Miners on small operations would support this alternative because changes in regulations would not affect their current occupation or lifestyle.

Increasing numbers of people in the West and across the country believe that the surface management regulations should increase emphasis on protecting amenity resources. (See discussion under National Attitudes at the beginning of this section.) Alternative 2 is not consistent with these attitudes.

The environmental advocacy groups who participated in scoping and many of the people associated with these groups would not support this alternative because it would result in no federal regulation of locatable minerals mining on public lands. In the opinion of these groups, this alternative would result in insufficient protection of resources on public lands. In addition, BLM would be seen as abdicating its management responsibility. The condition of the resources on public lands is important to these people because they value these resources for recreation, wildlife, scenic and spiritual qualities, and a variety of other reasons. Many appreciate just knowing that these areas exist and would continue to exist in the future.

Alternative 3: Proposed Action

Activity by small operations (i.e. exploration, placer mining, and open pit mining) is estimated to decline by 5% under the Proposed Action because more operations would have to submit Notices or Plans of Operations and meet other requirements such as bonding and reclamation. The effect is expected to be small and might lessen in the long term as miners become knowledgeable about the regulation changes. Miners on small operations would oppose these changes because of concern about impacts to their occupation and lifestyle.

Under the Proposed Action small rural communities are expected to lose only a small number of jobs relative to overall employment. All or some of this decrease might be due to forgone future mining rather than current operations shutting down. Little social impact to communities would be expected under this alternative.

Increasing numbers of people in the West and across the country believe that the surface management regulations should have an increased emphasis on protecting amenity resources. (See discussion under National Attitudes at the beginning of this section.) Alternative 3 is consistent with these attitudes, but some people would feel that the Proposed Action does not go far enough to protect the environment.

Under the Proposed Action the environmental advocacy groups who participated in scoping and many of the people associated with these groups would feel that wildlife and water resources are not being protected well enough. The condition of the resources on public lands is important to these people because they value these resources for recreation, wildlife, scenic and spiritual qualities, and a variety of other reasons. Many appreciate just knowing that these areas exist and would continue to exist in the future.

Alternative 4: Maximum Protection

Under the Maximum Protection Alternative estimates mineral activity for small operations (i.e. exploration, placer, and open pit mines) would decline by 15 to 25%. All operations would have to submit Plans of Operations and meet bonding and reclamation requirements. Miners who could not continue in the mining business might find the search for satisfactory alternative employment to be difficult. The stress of needing to change professions and possibly lifestyles has repeatedly surfaced as an important social problem. All people, through the socialization process, form a mental picture of "who they are." Groups of people such as loggers, ranchers, miners, and farmers tend to strongly identify themselves as belonging and being in a certain life role. It is extremely hard for them to imagine themselves "being" anything else (Lee and others 1991). This is especially true if the person has been engaged in a business and lifestyle for many years. The effects to these miners might be mediated by the fact that many rely on an array of skills and abilities, not just mining, to support themselves. Also, in the long run the effects might lessen as miners become knowledgeable about the new regulations. Miners on small operations would oppose these changes because of concern about impacts to their occupation and lifestyle.

In small isolated communities with a high degree of specialization in mining the impact of a mine shutting down would be significant. In these communities the loss of well paid jobs would result in outmigration, which would lower real estate values, the volume of local business activity, school enrollments, organizational membership, and community leadership. The tax burden might be increased or the level of services reduced for those who remain in the community. These changes could occur at a time of increased demand for social services due to employment losses. The economic security and outlook of most of the resident population, as well as their level of social well being would be negatively affected (Wenner 1992). Nevada communities would have the greatest potential for significant impact because of the potential impact to large open pit operations and their concentration in Nevada. Larger communities with a lesser degree of specialization in mining would be less likely to be affected.

Increasing numbers of people in the West and across the country believe that mining management should emphasize protecting amenity resources. (See discussion under National Attitudes at the beginning of this section.) Alternative 4 is consistent with these attitudes.

The environmental advocacy groups who participated in scoping and many of the people associated with these groups would support Alternative 4 because they would feel wildlife and water resources are being more adequately protected. Some environmental advocacy groups, however, would feel that the problems they perceive with locatable minerals mining on public lands are going to be addressed only with the revision of the 1872 Mining Law. The condition of the resources on public lands is important to these people because they value these resources for recreation, wildlife, scenic and spiritual qualities, and a variety of other reasons. Many appreciate just knowing that these areas exist and would continue to exist in the future.

Economic Conditions

Affected Environment

This analysis describes trends generally dating back to 1980, to include the entire period that surface mining regulations have been in effect, and also trends that are expected to affect the industry into the foreseeable future.

Mineral Production

Contribution of Western States to Domestic Mine Production. In 1996 mine production of nonfuel minerals in the United States totaled $38.7 billion. Currently the 12 western states in the study area contain 49% of the total land area in the United States (including all land ownership types) and contribute 42% of all nonfuel mineral production nationwide, $16 billion as of 1996. Moreover, the portion of total domestic production originating from the western states has been increasing since 1980, when 38% of total production came from the West (see Table 3-23).

Since 1990 the top three states in the United States in the value of mine production have been western states: Arizona, California, and Nevada. These three states alone, with 11% of the total U.S. land base, contribute 25% of the total value of domestic mine production of nonfuel minerals. Further, these three states possess 22% of the land base in the study area, but contribute 60% of area's total value of mine production (see Table 3-23).

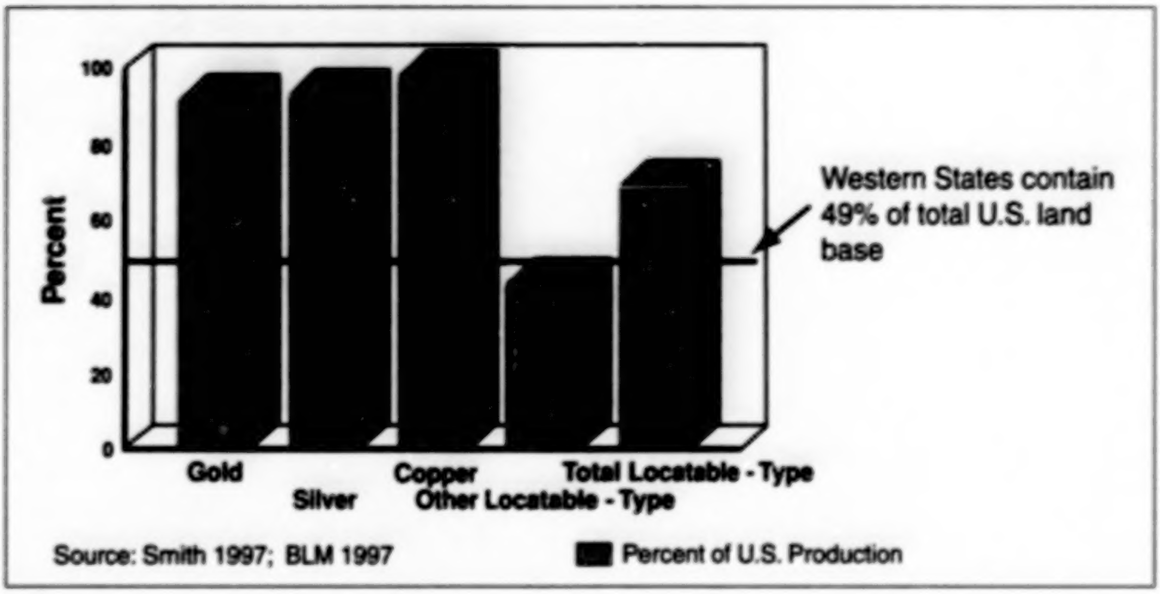
A closer look at production by commodity reveals that the western states contributed over 90% of all domestic precious metals production (e.g. gold and silver), 98% of all copper mine production, and 43% of other base metals and locatable-type industrials combined. Overall, the study area contributed an estimated 68% of the Nation's total locatable-type nonfuel mineral production in 1996, or $12 billion. ("Locatable-type" minerals are the types of minerals that if found on public land would be considered locatable.) As these numbers show, the western states produce a disproportionate share of domestic mine production of locatable-type minerals (see Table 3-24 and Figure 3-3).

Not all of this production comes from public lands administered by BLM. It is difficult to determine the portion of total mine production of all locatable-type minerals originating from BLM-administered land for two reasons: mines are not required to report these figures, and many mining operations are on lands in mixed ownership (some combination of federal, state, or private lands). Nevertheless, two recent reports estimate federal land production. These reports show that by commodity the portion mined from federal lands is highly variable (USDI Figure 3-3. Western States Contribution to U.S. Mine Production of Locatable-Type Minerals in Relation to Land Base, 1996. 1993; GAO 1992). About 43% of gold mine production in the western states is estimated to come from federal lands, 1% of copper production, and 2% of industrial minerals overall. Table 3-25 shows the portion of locatable-type minerals produced from federal lands based on these percentages. About 10%, or $1.8 billion, of all locatable-type minerals combined are estimated to originate from federal lands. Most of this value is due to gold production, of which $1.6 billion is estimated to come from federal lands.

Two factors may cause either an overestimate or underestimate of the value of

Figure 3-3

Western States Contribution to U.S. Mine Production of Locatable-Type Minerals in Relation to Land Base - 1996



Source: Smith 1997; BLM 1997

mine production from BLM lands. First, these estimates include all federal ownership, not merely BLM-administered lands, which would overstate the value of mine production. Second, these estimates do not include mining facilities other than the mine itself, which would tend to understate the amount of production originating from BLM lands.

Although mine production figures for some base metals such as zinc, lead, and molybdenum were generally unavailable by state for confidentiality reasons, several western states are major producers of these minerals. The western states are also major producers of many locatable-type industrial minerals. Table 3-26 shows the national ranking of the western states for many locatable-type minerals. It shows, for example, Alaska first and second in domestic mine production of zinc and lead, Arizona first in copper and molybdenum, Montana first in platinum group metals and talc, Nevada first in gold, and Wyoming first in bentonite and uranium.

Appendix G contains maps of the United States showing the importance of the western states to metal mine production (see Figures G-1 through G-4). It also shows that for nonmetallic minerals (industrial minerals) mine production across the United States is more evenly distributed.

Trends in Mineral Production and Exploration

This section describes trends since 1980 for the three main commodity groupings: precious metals, base metals, and industrial minerals, including projections for future activity. The projections are fairly general, given the diversity of mining on public lands: the wide variety of mining methods, commodities extracted, geographic scope, and inherent uncertainty of commodities markets. These projections are based on historic trends in mining and current trends in commodity prices, exploration, and technological changes.

Precious Metals. Precious metals include gold, silver, and platinum group metals (platinum and palladium being the most important, commercially). As noted in Table 3-27, 93% of the $4.3 billion total value of precious metals mine production in the United States in 1996 was attributable to gold ($3.98 billion), silver accounted for 6% ($263 million), and the platinum group metals (PGM) accounted for the other 1% ($49 million). Due

Table 3-23. Value of Nonfuel Mineral Production 1980-1996 ($000)[1]

State	1980	1990	1996	Statewide Acreage[2]
Alaska	$113,000	$577,000	$613,000	$365,482,000
Arizona	2,430,000	3,065,000	3,580,000	72,688,000
California	1890,000	2,780,000	2,830,000	100,207,000
Colorado	1,260,000	386,000	513,000	66,486,000
Idaho	522,000	400,000	449,000	52,933,000
Montana	280,000	568,000	491,000	93,271,000
Nevada	386,000	2,611,000	3,230,000	70,264,000
New Mexico	765,000	1,098,000	992,000	77,766,000
Oregon	150,000	237,000	265,000	61,599,000
Utah	759,000	1,334,000	1,730,000	52,697,000
Washington	207,000	473,000	535,000	42,694,000
Wyoming	761,000	911,000	1,080,000	62,343,000
Study-Area Total	9,520,000	14,440,000	16,308,000	1,118,429,000
U.S. Total	$25,108,000	$33,319,000	$38,700,000	$2,271,343,000
Study Area as Percent of U.S.	38%	43%	42%	49%

[1] Includes all nonfuel minerals, not all of which are "locatable-type" (such as sand and gravel, and other construction-type industrial minerals). Dollar figures rounded to three significant digits.

[2] Figures represent total statewide land area for all ownership types (federal and nonfederal).

Sources: Smith 1997; USBM 1982, 1992; BLM 1997.

Table 3-24. Estimated Value of "Locatable-type" Nonfuel Mineral Production,[1] Total Value of Nonfuel Mineral Production and Ranking of Western States - 1996 ($000)

State	Gold	Silver	Copper	Other Metals and Industrials[2]	Total Value of Mine Production (Locatable-type Minerals)	Total Value of Mine Production (All Nonfuel Minerals)[3]
Alaska	$61,000	$21,800	N/A4	$478,000	$561,000	$613,000
Arizona	21,800	31,500	2,980,000	304,000	3,340,000	3,580,000
California	299,000	3,620	0	959,000	1,260,000	2,830,000
Colorado	60,000	1,250	0	251,000	312,000	513,000
Idaho	92,800	38,400	N/A	243,000	374,000	449,000
Montana	114,000	15,700	94,000	223,000	447,000	491,000
Nevada	2,680,000	101,000	58,000	233,000	3,070,000	3,230,000
New Mexico	5,010	3,330	615,000	76,200	700,000	992,000
Oregon	0	0	0	76,200	76,200	265,000
Utah	290,000	27,700	708,000	530,000	1,560,000	1,730,000
Washington	48,600	0	0	163,000	212,000	535,000
Wyoming	0	0	0	202,000	202,000	1,080,000
Study-Area Total	3,670,000	244,000	4,500,000	3,740,000	12,100,000	16,300,000
U.S. Total	$3,980,000	263,000	$4,610,000	$8,800,000	$17,700,00	$38,700,000
Study Area as Percent of U.S. Total	92%	93%	98%	43%	68%	42%

[1] Includes gold, silver, copper, and other metals (platinum group, lead zinc, molybdenum, etc.). Also includes large variety of industrial minerals such as barite, bentonite, diatomite, gemstones, gypsum, limestone, perlite, pumice, silica stone, talc, vermiculite, etc. [2] Other Base Metals and Industrials exclude common clay, phosphate, potash, salt, sand, gravel, sodium, stone, and sulfur because these minerals are not "locatable" when found on public land. [3] For some states, figures for specific minerals reported by USGS were withheld to avoid disclosure of confidential data and appear in totals with other minerals. Consequently, for some minerals (e.g. copper), state production values were estimated from state reports and other sources. Some other withheld mineral values are contained in "Total Value of Mine Production." [4] N/A means not available or not applicable.

Source: Smith 1997; USGS various years (b).

Table 3-25. Value of Locatable Mineral Production Originating from Federal Lands - 1996 ($000)

Portion of study-area production originatin from public lands[1]	43.4%	36.2%	1.0%	2.4%	N/A
State	**Gold**	**Silver**	**Copper**	**Other Metals and Industrials**	**Total**
Alaska	$26,500	$7,890	$0	$11,500	$45,800
Arizona	9,500	11,400	29,800	7,300	58,000
California	130,000	1,310	0	23,000	154,000
Colorado	26,000	453	0	6,020	32,500
Idaho	40,300	13,900	0	5,830	60,000
Montana	49,500	5,680	940	5,350	61,500
Nevada	1,160,000	36,600	580	5,590	1,210,000
New Mexico	2,170	1,210	6,150	1,830	11,400
Oregon	0	0	0	1,830	1,830
Utah	126,000	10,000	7,080	12,700	156,000
Washington	21,100	0	0	3,910	25,000
Wyoming	0	0	0	4,850	4,850
Study-Area Total	1,590,000	88,400	44,550	89,700	1,820,000
U.S. Total (all land types)	$3,980,000	$263,000	$4,610,000	$8,800,000	$17,700,000
Federal Land Portion as Percent of U.S. Total	40%	34%	1%	1%	10%

[1] Source: USDI 1993.
N/A = not applicable. Figures rounded to three significant digits. Some totals may reflect rounding errors.
Note: Includes all production from federal lands, not just production from BLM-administered lands.

to the overwhelming dominance of gold over other precious metals, the following analysis of trends in precious metals focuses on gold.

Production. Gold production in both the United States and worldwide has increased dramatically since 1980. In 1980, 960,000 troy ounces were produced in the United States, accounting for 2.5% of worldwide production; by 1996 the United States produced 10.2 million troy ounces, accounting for over 14% of worldwide production. (see Figure 3-4).

Over 90% of current domestic production comes from the western United States, especially Nevada, which accounts for two-

Table 3-26. Ranking of Western States by Mine Production of Mineral Commodities¹

	National Ranking					
State	**#1**	**#2**	**#3**	**#4**	**#5**	**#6-#10**
Alaska	Zinc	Lead			Silver	Gold (7)
Arizona	Copper Molybdenum	Perlite	Gemstones Silver		Zeolites	Pumice (6)
California	Asbestos Boron Diatomite Rare-earth metals Tungsten	Gold Magnesium	Feldspar Perlite Pumice		Bentonite Gypsum	
Colorado			Molybdenum		Lead	Zinc (6) Gold (8)
Idaho	Antimony Vanadium ore	Garnet Silver	Lead	Molybdenum Pumice		Gold (6)
Montana	Platinum Palladium Talc	Bentonite		Copper Lead	Gold Molybdenum Zinc	Silver (6)
Nevada	Barite Gold Magnesite Mercury Silver	Diatomite Lithium		Gypsum Perlite Zeolites	Copper	
New Mexico	Perlite Zeolites	Pumice Mica	Copper			
Oregon	Pumice			Diatomite	Gemstones	
Utah	Beryllium concentrates	Copper Molybdenum	Gold Magnesium metal	Silver Magnesium compounds		Bentonite (7)
Washington	Magnesium metal	Diatomite				Gold (10)
Wyoming	Bentonite Uranium					

¹Includes "locatable-type" minerals mined statewide regardless of surface ownership.
Sources: USGS 1997a, 1997b.

Table 3-27. Precious Metals Value of Production 1996 ($000)

Commodity	Value	Percent of Total Value
Gold	$3,980,000	93%
Silver	263,000	6%
Platinum Metals Group	49,000	1%
Total	$4,290,000	100%

Source: Smith 1997.

thirds of U.S. gold production. Four of the top-five producing states are in the study area: Nevada, California, Utah, and Montana, in that order. (South Dakota is the fourth largest producer.) The U.S. Geological Survey estimates that gold is currently produced at 120 lode mines, a dozen or more large placer mines, and many smaller placer mines. Most of these placer operations are in Alaska. Of the domestic gold produced, the 23 largest mines yielded 83%, and 75 mines produced 98% of the total (Amey 1997). Twenty of these top 23 are in the study area.

The most significant rate of increase in production between 1984 and 1990, when gold production increased by an average annual 29% (from 2 million troy ounces annually to 9.3 million troy ounces annually). Since 1992, however, production has been steady at 10.5 million troy ounces annually. Despite the recent leveling off in domestic production, preliminary estimates of 1997 production reveal somewhat of an increase from the 1996 production level due to the start-up of a several new mines (USGS 1998).

Generally, gold mine closures are keeping pace with new gold mine openings and expansions in the United States At the same time the average output per mine has increased, resulting in a trend to fewer but larger U.S. gold mines. Most of the larger companies are replacing their annual production with new reserves, but smaller companies are finding this task more difficult (USGS 1998).

The United States is currently the world's second largest producer behind South Africa, which produced 21% of all gold in 1996 (down from more than half of total world production in 1980). Other significant producers are Australia (13%), which ranks close behind the United States, Russia (9%), and Canada and China (7% each). The rate of increase in production in Australia over the past 16 years has been impressive as well. In fact, Australia's growth in production appears to have positioned it in the near future to replace the United States as the world's second largest producer (Murray 1997).

The dramatic increase in gold production worldwide over the past 17 years is attributable to a variety of factors: technological changes in gold mining methods such as the refinement of heap leaching techniques and the extraction of gold from refractory ores, long-term sustained increases in gold prices following the end of government price and ownership controls in the 1970s, an increase in demand for gold, increased access to deposits outside the United States, and a large sustained increase in exploration for new gold discoveries in response to these changes.

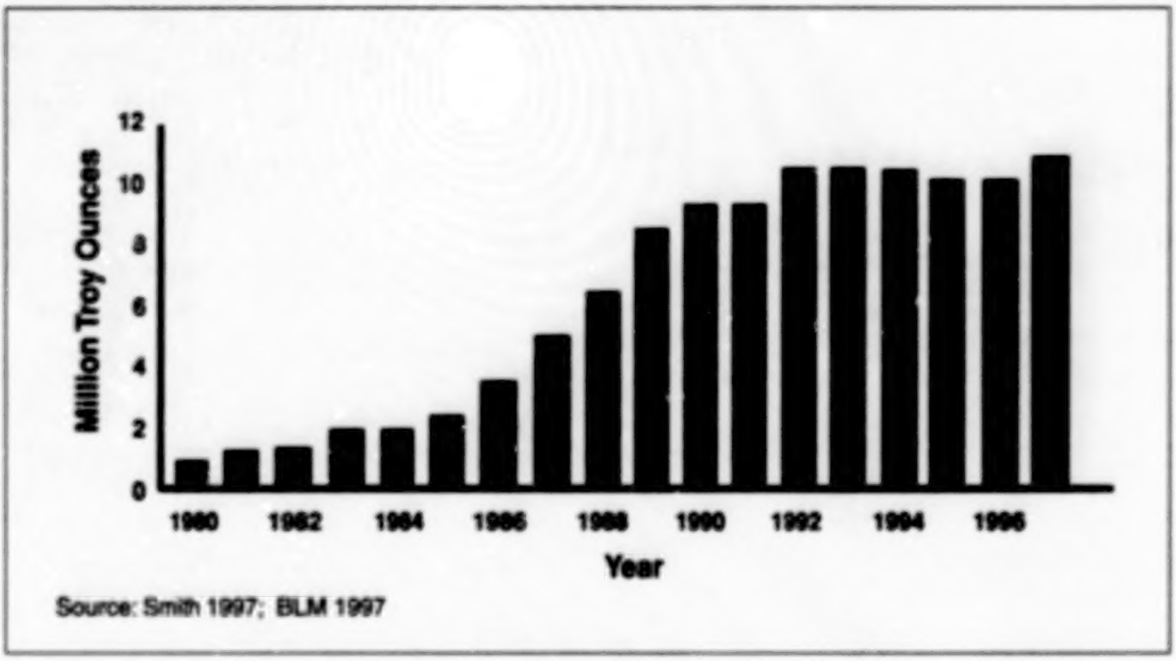
The worldwide gold reserve base has increased by 126%, from just over 1 billion troy ounces in 1980 to 2.3 billion troy ounces in 1996. The U.S. reserve base more than tripled over that period (from 60 million to 196 million troy ounces). As a result the United States share of the worldwide base increased from 6% to almost 9%.

Exploration. Exploration expenditures worldwide and in the United States continue to be dominated by gold. In 1997 two-thirds of all exploration expenditures are estimated to have been spent looking for gold (Wilburn 1998).

Exploration in the United States peaked in the 1980s but is still considered strong. Domestic exploration (for all nonfuel minerals) is decreasing as a percent of worldwide exploration expenditures (from over 21% in 1992 to 9% in 1997), but spending on a total dollar basis has remained steady (Wilburn 1998). Much of the domestic exploration for gold is aimed at replacing annual production at existing operations with new reserves rather than focusing on new discoveries.

Figure 3-4

U.S. Gold Production 1980-1997.



Source: Smith 1997; BLM 1997

In recent years the focus has shifted to other regions of the world, such as Latin America, Asia and the Pacific, and Africa. Many countries have revised their mining laws, are offering incentives for foreign investment, and in some cases have opened up areas previously closed to exploration. The transformation of centrally planned economies to market-based economies has also made deposits in these countries more attractive as investment opportunities (Amey 1997).

In addition to the "pull" of other countries as exploration targets due to economic and political reforms, there is also the view that permitting and environmental requirements in the United States are "pushing" exploration out of the United States (Dobra 1997; Wilburn 1998). On the other hand, internationally recognized environmental standards are increasingly required to secure funding for mining projects regardless of location (White 1997). These requirements would tend to negate the potential cost advantage of fewer permitting and environmental requirements. Further, as noted in a recent study of the revival of the domestic copper industry in the 1980s, for the metal mining industry to succeed in the current economic environment, firms must constantly pursue new technologies and productivity gains (Tilton and Landsberg 1997) irrespective of permitting and environmental requirements of the host country. This quest has created a highly competitive global mining industry. Thus, the net effect of these factors on United States production is difficult to ascertain.

Prices. Gold prices play a significant role in the exploration and development of gold deposits. Between 1974—when the last of government price controls and restrictions on gold trading were abolished—and 1996 prices steadily and sometimes dramatically increased, peaking in 1980 at an average annual price of $613 (see Figure 3-5). From the late 1980s to 1996 the average annual price fluctuated within a relatively close range of $340 to $390 per troy ounce. But since the latter part of 1996 the price has trended downward rather significantly, hovering in the range of $280-$300 for nearly 2 years.

The recent downward trend has been mainly attributed to central bank sales, speculative selling, producer hedging, fears of future sales by central banks, and economic turmoil in Southeast Asia, Russia, and, more recently, Latin America. This downward pressure has occurred despite evidence of strong worldwide physical demand for gold (Murray 1998). Some of this worldwide demand, however, was expected to originate from Southeast Asia, which has recently been suffering from an economic downturn that has consequently dampened the increase in demand. Increased apprehension about global economic conditions combined with recent gold market conditions makes the outlook for gold prices and the market highly uncertain (Murray 1998).

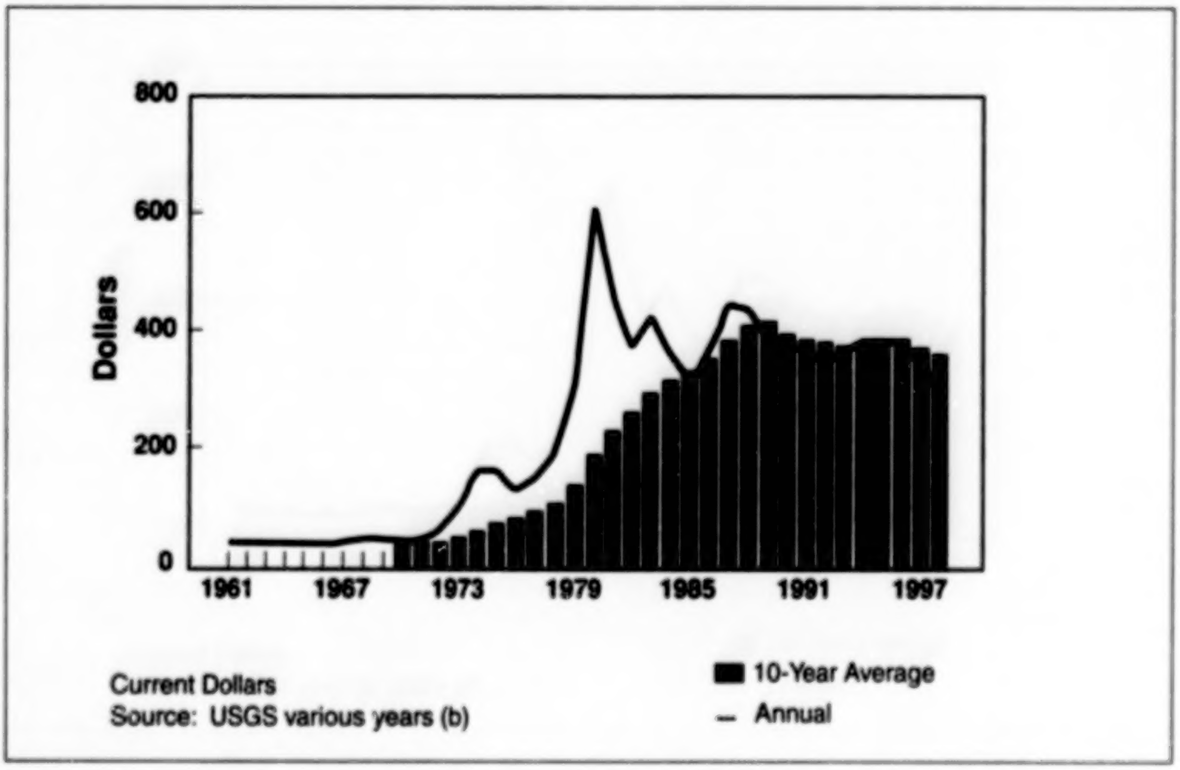
Projections. Currently there is a great deal of uncertainty in the gold market. Although demand for gold has been strong in recent years, oversupply remains a problem (Gentry 1998). Growth in demand for gold is expected to continue for the foreseeable future due to demand for gold jewelry, which accounts for 80% of total worldwide demand for gold (Murray 1998). Population growth around the world and increased standards of living in many developing countries will contribute to this strong demand. But worsening economic conditions in some countries could dampen the growth in demand for gold in the foreseeable future.

At the same time, the globalization of mining opportunities has opened to exploration and development many areas that had previously been closed. Thus, worldwide supply of minerals such as gold are expected to increasingly originate from countries other than the United States, although interest in exploration in the western United States, especially Nevada, is expected to remain strong (Gentry 1998).

The World Gold Council anticipates that future gold production will increase at a slower rate in the future than during the 1980s and

Figure 3-5

Average Gold Prices, 1980-1998.



Current Dollars
Source: USGS various years (b)

1990s, at 1.3% to 3% per year, in contrast to annual growth rates of over 4% for the past 17 years and growth rates in the 1980s exceeding 6% (Kral 1997).

Given the recent trend in steady domestic gold production, the dramatic increase in production opportunities outside the United States, worldwide demand for gold, the anticipated rate of growth in supply, and high level of uncertainty concerning gold prices and other market conditions, annual domestic production is expected to remain steady or slightly increase for the foreseeable future. Further, it is anticipated that the western United States, especially Nevada, will remain the dominant region for production. Most of the existing large mines are expected to continue operating as depleted reserves are replaced. And new mines are expected to come online as other mines exhaust their reserves.

This scenario assumes that gold prices stabilize in the range observed over the recent past. An extended period of low gold prices, such as that experienced since 1996, could reduce gold production in the future. Lower prices will tend to hit exploration activities first—there is evidence that this has already occurred—as well as smaller, high-cost producers. Some mines may close earlier as higher graded, lower cost ores are extracted and are not replaced by new reserves. However, most of the larger, newer, low-cost producers are expected to withstand current gold market conditions. Conversely, a sustained significant increase in price would spur more exploration for new ore bodies and encourage extraction of lower-grade ores at existing mines, thereby extending the life of many of these mines.

Up to 43% of total domestic production comes from public lands (including both BLM and Forest Service lands). But a substantial portion of existing mines are awaiting patent approvals that would move them from public to private ownership. This patenting will decrease the portion of total domestic production from public lands in the foreseeable future. In the longer term, however, if public lands become permanently closed to patenting (there is currently a congressional moratorium on new patent applications), the portion of domestic gold production attributable to public lands would likely begin to increase once again.

Pending Plans of Operations for exploration or development have been factored into these projections. Most of the current pending Plans are for precious metals exploration or development, and most of these are for expanding existing operations.

Base Metals. The base metals category includes a variety of minerals such as copper, lead, zinc, iron ore, molybdenum, and nickel. The base metals with the greatest production in the western United States are copper, lead, molybdenum, and zinc. As noted in Table 3-28, 74% of the $6.2 billion total value of U.S. production of the major base metals in 1996 was attributable to copper ($4.6 billion). Zinc accounted for 11% ($676 million), and lead and molybdenum each accounted for 7% ($460 million each). Because of the dominance of copper over other base metals, the analysis of trends in base metals will focus on copper. The copper trends are meant to generally represent trends for the other base metals as well.

Copper Production. Since 1980 copper production in the United States has increased by 63%, from 1.2 million to 1.9 million metric tons annually (Figure 3-6). U.S. production accounted for 18% of worldwide production in 1996, a 20% increase from its 15% share in 1980.

Five western states accounted for 98% of domestic copper production in 1996. In descending order these states are Arizona (2/3 of all domestic production), Utah, New Mexico, Montana, and Nevada. While copper was

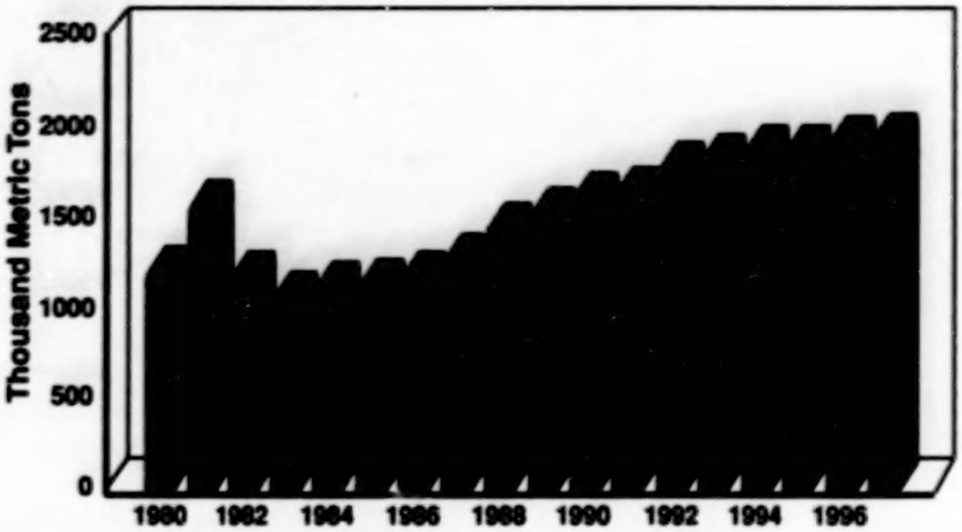
Table 3-28. Base Metals Value of Production 1996 ($000)

Commodity	Value	Percent of Total Value
Copper	$4,610,000	74%
Lead	459,000	7%
Molybdenum	456,000	7%
Zinc	676,000	11%
Total	$6,200,000	100%

Source: Smith 1997.

Figure 3-6

U.S. Copper Production, 1980-1997.



1997 production is preliminary estimate
Source: USGS various years (a)

extracted from 37 mines, 17 mines accounted for 98% of all domestic production in 1996 (Edelstein 1997). By contrast, in 1980, 25 mines yielded 96% of all domestic production (USBM 1981). These statistics show that, like gold mines, copper mines tend to be decreasing in number but increasing in output.

Copper is mined in about 50 countries. With 18% of world production, the United States is the world's second largest copper producer behind Chile, which accounted for 28% of 1996 worldwide production. Other significant producers include Canada. Domestic production in 1996 resumed an upward trend that began in 1984 but had stalled for a couple years recently, registering a 4% increase. World production increased at an even faster pace than domestic production, rising 8% last year. Most of the expanding capacity came from Chile, where U.S. companies continued to invest heavily to expand production and reduce costs. Most U.S. copper mining companies reported record profits from copper operations in 1995 owing to high production levels, lowered operating costs, and record-high copper prices. Copper prices in 1996, on the other hand, declined by an average 20% from 1995.

The worldwide copper reserve base has increased from 505 million metric tons in 1980 to 610 million metric tons in 1996, a 20% increase. But the U.S. reserve base has remained unchanged since 1980 at 90 million metric tons. Consequently, as a portion of the worldwide base, the U.S. share has declined from 18% to 15%. Most of the increase in the reserve base is due to new deposits in Latin America, especially Chile (USBM and USGS various years).

Exploration. Exploration budgets for base metals in 1997 made up 27% of worldwide exploration expenditures reported to the Metals Economics Group. Copper was the dominant target (Wilburn 1998). In the short- and mid-term, oversupply is expected to continue and result in decreased exploration worldwide and in the United States (Wilburn 1998; Silva 1998).

Domestically, copper exploration is still centered in Arizona, although New Mexico, Utah, and very recently Nevada, are also active.

Projections. Over the next few years copper mining production capacity worldwide is expected to outstrip growth in demand for copper and lead to a modest surplus. Latin America, especially Chile, is expected to account for most of the increased production capacity. Significant increases are also projected for Australia, Canada, Indonesia, and the Philippines (Edelstein 1997). Domestic production is expected to continue to rise slowly but steadily.

Currently only 1% of domestic copper mine production is located on federal land, including land managed by BLM and other federal agencies, a much smaller percentage than is estimated for gold production on federal land (USDI 1993). This situation is also expected to continue since there is currently little exploration for copper on public lands in Arizona, the dominant copper producing state (Kershaw 1998). But currently several Plans of Operations are pending for copper mine expansions in New Mexico and Arizona, and one new mine in New Mexico that could increase the amount of copper production from public lands. These mines are located on private lands but will be expanding onto public lands for millsite facilities. These operations would all be operating on a mixture of BLM and nonfederal lands. No Plans of Operations are pending approval for base metals other than copper.

Industrial Minerals. The industrial minerals category includes a wide variety of minerals with a great diversity of end uses. This category includes primarily all the nonfuel minerals not included as precious or base metals. Industrial minerals can generally be broken into subcategories related to their end uses. Many minerals, however, fit into more than one subcategory. For example, the *construction* subcategory includes minerals such as crushed stone, sand and gravel, pumice, gypsum, limestone, and some clays. Other subcategories include *chemical* (e.g. salt, lithium, iodine, bromine, strontium, and lime), *agricultural* (e.g. potash, phosphate rock, sulphur), *abrasives* (e.g. pumice, silica sand), *fillers and extenders* (e.g. talc, mica, kaolin clay, graphite), and a *miscellaneous* subcategory (including some high- value minerals such as titanium and rare earths).

Not all industrial minerals are locatable if found on public land. Examples of locatable industrial minerals include barite, bentonite, diatomite, feldspar, gemstones, gypsum, magnesium compounds, perlite, pumice, silica stone, talc, and vermiculite. Many other industrial minerals are considered either leasable or saleable, such as sand and gravel, common clays, crushed stone, some limestones, phosphate, potash, sodium (including soda ash), and sulfur. Since leasable and saleable minerals are not locatable, they are not included in this analysis.

The estimated value of locatable-type industrial mineral mine production attributable to the study area was $2.7 billion in 1996. This estimate was derived from Table 3-24, which appears earlier in this chapter. Table 3-24 shows that "Other Metals and Industrials" totaled $3.7 billion in mine production value. But $1 billion of that amount can be attributed to base metals such as lead, molybdenum, and zinc, with the remaining $2.7 billion attributable mainly to industrial minerals.

The large number of commodities in the industrial minerals category makes it difficult to assess the general trends in exploration and production for each mineral. It is also difficult to assess the general trends for the category of industrial minerals as a whole given the wide variety of end uses. Nevertheless, an increase is expected in exploration and development of industrial minerals on western public lands in the foreseeable future for several reasons. First, the general overall growth in the domestic economy (and internationally) is fueling an increase in demand for most of the end uses to which industrials are put. Second, many deposits of industrials previously on public land have already been transferred to private ownership through the patenting process. Therefore, future operations are expected to increasingly originate from public lands, assuming continuation of the congressional moratorium on new patenting. And third, generally speaking, many industrials are mined relatively close to where increases in economic activity and population growth are greatest, and many western states are experiencing rapid economic and population growth.

According to a 1993 Department of the Interior study, industrial minerals with more than 10% of total domestic production from federal lands (including federal lands not managed by BLM) include diatomite 53%, fullers earth 11%, gemstones 50%, pumice 14%, silica stone 25%, and talc 42% (USDI 1993).

Currently several Plans of Operations are pending for industrial minerals. Six Plans are for expanding gypsum, limestone, silica sand, and cinder mines; the other two pending Plans are for two new gypsum mines.

Strategic and Critical Materials. Strategic and critical minerals are those in which the United States is deficient or domestic sources are insufficiently developed to supply the military, industrial, and essential civilian needs of the United States for national defense. To reduce dependence on foreign sources in times of national emergency, Congress established the National Defense Stockpile (NDS) of strategic and critical minerals. In recent years, however, the Department of Defense has been liquidating much of the stockpile, and the goals for maintaining inventory for many minerals have been eliminated, although the list remains (U.S. Department of Defense, Defense Logistics Agency 1997; Mory 1998).

Many of the minerals on the strategic and critical list are locatable-type minerals. Inventory of only a few of the minerals on the list, however, is lower than National Defense Stockpile goals, for example, cobalt, graphite, some gemstones, mica, and platinum group metals.

Contribution of Mining to the Regional and National Economy

The mining industry for locatable-type minerals is an important contributor to the economies of the western states, the national economy, and especially to some counties in the study area with significant mining. The contribution to these economies can be measured in several ways: the value of mineral production (see previous section); contribution to each state's gross state product and to national gross domestic product; the level of employment and personal income directly attributable to the mining industry; the number of mining establishments; the "multiplier effects," which estimate the indirect and induced economic effects of mining in addition to direct effects; and the role of mining in the economies of mineral-rich rural communities. The following section describes the economic contribution of locatable mine production *overall* for the study area (except where noted), not merely the portion attributable to public lands. Locatable minerals production on public lands contributes an estimated 10% of the study area's total value of mine production overall, although this percentage varies by commodity.

In *gross state product* (GSP) mining for metals and nonmetallic minerals in the study area collectively contributed $7.8 billion in 1996, the latest year for which GSP data are available (BEA 1998). GSP is a state's sum of each of its industries' gross output less intermediate goods and services purchased from other industries or imported, also referred to as "value added." This represents 0.5% of the study area's combined GSP of $1.67 trillion. More significantly, however, the study area contributed 46% of the Nation's total gross domestic product (GDP) for the metals and nonmetallic minerals mining sectors combined. For the metals-mining sector alone, the study area contributed 73% of the Nation's total GDP (see Table G-1 in Appendix G). Gross domestic product is the sum of the GSPs for the 50 states.

Trends in mining's contribution to GSP since 1982 are uneven when comparing the western states to one another. (Note: Due to new indexing techniques used for estimating inflation-adjusted changes in gross domestic product, 1982 is a more appropriate base year for this trend analysis than 1980, which is the base year used for other statistics in this section.) With regard to metals, most states showed increases in contribution to GSP between 1982 and 1996, as measured in 1996 dollars, but three states showed declines: Colorado, Oregon, and Wyoming. Of the states showing increases, the change varied from a 7% increase in contribution to GSP in New Mexico to a 2,600% increase in Alaska. But on a total dollar basis, the largest increase in contribution to a state's GSP came in Nevada, where metal mining increased by $1.6 billion, from $216 million to more than $1.8 billion.

For nonmetals all states except Utah showed increases in the contribution of nonmetals to each state's GSP. (The decline is Utah was 41%. Although this decline appears to be significant, nonmetals contributed only 2% to Utah's overall mining GSP in 1996.) The increase ranged from 22% in Idaho to 245% in Colorado. On a total dollar basis, California showed the largest increase, from $382 million in 1982 to $903 million in 1996, a $521 million increase. It is difficult to tell how much of the nonmetals category is attributable to locatable-type minerals. The nonmetal category in GSP includes many minerals that are not locatable, such as sand and gravel and many other construction-type minerals. Many of these minerals are mined near construction sites. Because the West has been experiencing record population growth, much of the increase can be attributed to these construction minerals.

On the whole, the western states showed a 170% increase in metal and nonmetallic mining's contribution to GSP, from $2.9 billion in 1982 to just over $7.8 billion in 1996, as measured in 1996 dollars. This increase is the combined result of a 212% increase in metals and a 118% increase in nonmetals. During the same period, the combined GSP of the region increased by 59% overall. The net result is that the contribution of metals and nonmetals in the western states, *as a portion of the region's total GSP*, increased from 0.3% in 1982 to 0.5% in 1996.

Another measure of the contribution of locatable-type mining is in *personal income and employment*. This information is collected in detail by state and reported nationally by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). The study area's direct contribution of the metals and nonmetallic minerals mining industries was $3.2 billion in personal income (Table G-2 in Appendix G) and an estimated 71,000 jobs in 1996, the latest year for which data are available. This amount represents less than 1% of the study area's total personal income and employment, which is consistent with the GSP measures. Total personal income nationally for mining was $8.8 billion in 1996, so the study area's contribution represents 39% of all mining.

BEA data do not actually report employment statistics separately for metal and nonmetallic mineral mining. The estimate of 71,000 jobs for the metal and nonmetallic subsectors was derived from the personal income data reported for these subsectors. The Bureau of Labor Statistics (BLS), however, also reports employment levels and trends. BLS figures do not match BEA figures due to differences in data collection, but BLS does report employment in more industry detail, for example, by mining subsector, not just mining overall. Although Bureau of Economic Analysis and Bureau of Labor Statistics employment figures don't match in absolute numbers, these two data sets do show similar *trends* for levels of mining employment and mining's share of total employment, both at the state and national level.

During the 17-year period from 1980 through 1996, BLS data show that metal mining employment in the study area declined by 41%, from 65,000 to 38,500 jobs. This amount tracks the national trend, which showed a 46% decline over the same period. Employment in nonmetallics declined by 20% in the study area, compared to a 14% decline nationwide. At the same time, overall employment in the study area increased by 42% (Ball 1997). This decline shows that mining employment has become a smaller portion of total employment over the past 17 years, even while mine production has increased significantly over that period (see Table G-3 in Appendix G).

There are exceptions to these trends. The most obvious counter-trend has occurred in Nevada, where metal mining employment increased by 257% from 3,600 jobs in 1980 to 13,000 by 1996. Nevada currently contributes a third of all metal mine employment in the study area, virtually all related to gold mining. (Nevada and Arizona combined contribute two-thirds of all metal mining employment. Arizona's employment is attributable mostly to copper mining.) Alaska also shows a significant increase of 225% in metal mining employment, but the state overall contributes only 3% of all current metal mining employment in the study area. Montana registered a 9% increase, from 1,900 to 2,100 employees.

While overall trends in employment and income in the metal and nonmetallic mineral mining industries show declines, looking at these trends alone would tend to understate the importance of these sectors to the economies of the western states and the Nation as a whole. These employment and personal income figures represent the *direct* impact the metal and nonmetallic mining sectors have on the regional and national economies. In addition to direct employment and income effects, these industries purchase capital equipment for mine development, buy operating supplies and business services, and hire workers who in turn spend their incomes on goods and services. These additional spending levels create a *multiplier effect*, which accounts for indirect and induced effects as well as the direct effects. The sum of direct, indirect, and induced effects is the multiplier effect, or total economic impact.

The IMPLAN input-output modeling system was used to estimate the total economic impact of locatable mineral production on public lands in the study area for 1996 mine production. (These impacts are based on the 10% of the total value of mine production estimated to originate from federal lands.) The $1.8 billion in production value is estimated to have contributed $3.3 billion dollars in *total industry output*, $1.5 billion in *total income* (of which $819 million is employee compensation), $1.7 billion in *value-added*, and 23,000 *jobs* overall to the study area (see Table 3-29). The greatest impact is attributable to mining in Nevada, where 56% of all total industry output and half of all jobs are located. Nevada's supremacy is due to the large amount of gold from federal land that is produced in the state.

Total industry output measures the total economic impact of purchases within the study area by the mining industry to mine locatable minerals, e.g. capital equipment purchases and operating expenditures, in 1996. Total income impacts translate the impact of changes in expenditures by the mining industry into changes in income. Income includes employee compensation, proprietary income, and other property income. Employee compensation, as a subset of total income, represents total worker income generated by mining industry expenditures. Employment impacts represent the total number of jobs generated by final demand expenditures by the mining industry in the study area, as measured by both full- and part-time jobs. Appendix G, *Methodology for Estimating Contribution of "Locatable-Type" Mineral Production on the Economies of the 12 Western States*, explains how these estimates were derived using the IMPLAN input-output model.

A variety of other recently completed studies have measured the economic impact of the mining industry. One study, *The U.S. Gold Industry 1996*, found that in 1995 gold and silver production nationwide contributed $7.8 billion in output, $2.4 billion in earnings, and more than 90,000 jobs (Dobra 1997). The study notes that most of this impact is due to mine production from the western states. This study and the IMPLAN impacts mentioned above use different models and thus produce different results. The Dobra study focuses on gold and silver and includes all land ownership types. The IMPLAN analysis in this EIS includes most locatable minerals, and only the portion estimated to be mined from public lands. A similarity of these two results is that measuring the multiplier effect state by state misses the economic impact that a mining company makes in states outside the area modeled, a limitation noted in the Dobra study. For example, capital equipment purchases made by a mining company in Nevada to a firm in Illinois would

Table 3-29. Estimated Regional Impacts from Production of Locatable Minerals on Public Lands 1996 ($000)

		Personal Income			
State	**Total Industry Output**	**Total**	**Employee Compensation**	**Value Added**	**Employment (Jobs)**
Alaska	$52,800	$42,800	$11,400	$31,400	370
Arizona	53,700	26,700	15,900	31,200	410
California	233,900	124,500	75,700	136,200	1,650
Colorado	47,000	23,200	13,200	27,500	280
Idaho	79,800	41,100	24,500	47,300	675
Montana	86,200	40,200	25,100	51,700	570
Nevada	1,866,900	854,800	479,900	935,300	11,060
New Mexico	13,200	4,900	2,300	6,600	100
Oregon	1,100	800	500	900	10
Utah	108,100	43,700	23,100	54,000	760
Washington	27,900	16,500	10,700	18,600	170
Wyoming	3,300	1,700	800	2,300	30
12-State Area	$3,339,300	$1,495,300	$819,200	$1,706,300	22,860

Note: These estimates include only production estimated to originate from federal lands
Source: IMPLAN Input-Output Modeling System (see Appendix G).

not show up as an injection into the Illinois economy unless Illinois were part of the study area modeled. Consequently, some economic contributions from mining investment are understated at the national level. This is not unique to mining impacts, however. Assessing the economic impact of one sector within a state on that state's economy is subject to this limitation.

Another study, published by the National Mining Association, estimated the economic impact of the solid-minerals mining industry (Leaming 1997). This study, which includes minerals such as coal and many nonlocatable-types, estimated that the western states generated $115 billion and 1.1 million jobs in 1995, or 37% of the total U.S. impact of solid-mineral mining of $524 billion and 22% of the estimated 5 million total jobs. The data and methodology used in this study differ substantially from the multiplier analyses described previously. The figures from the two studies cannot be compared, but the Leaming (1997) study provides a useful comparison of the western mining industry in relation to the national industry.

Mining is also important to many rural communities and counties in ways that are not captured by looking strictly at its contribution to the state or regional economy. Many western counties have significant amounts of locatable mining, which contribute a disproportionate share of local employment and income in relation to the industry's contribution statewide. One way to measure this contribution is by the use of a "location quotient." A location quotient is simply a ratio of a county's percent employment in a particular industry to the statewide percent employment in that industry (USFS and BLM 1998). A location quotient greater than 1 shows that the county is specialized in that industry. The greater the quotient exceeds 1, the greater the degree of specialization.

Using standard Bureau of Economic Analysis (BEA) employment data, one can determine location quotients only for the mining sector as a whole because employment data is not reported in greater detail as, for example, for metal mining. But estimating location quotients using BEA personal income data rather than employment data does allow for greater industry detail. For this reason, BEA personal income data is used in this analysis rather than employment data to illustrate why the level of specialization in metal and nonmetallic mining for counties in the study area can be an important issue.

The area encompassing the Carlin Trend in Nevada provides just one good example of how important mining can be to local economies. Mining in the Carlin Trend area most immediately affects Elko and Eureka counties. In this area most of the metal mines are located in Eureka County, but most mine employees live in Elko County. (Other mines in these two counties but not on the Carlin Trend are also included in the analysis.) In 1996 metal mining contributed $335 million personal income to the area, nearly one-third (32.8%) of the area's total personal income of $1.02 billion. In contrast, metal mining provided 1.8% of total personal income statewide ($748 million of the state's total personal income of $41.7 billion). The location quotient for employment in the Elko-Eureka counties area, then, is 18 (32.8% divided by 1.8%), showing a high degree of mining specialization for the area.

Further evidence of the importance of mining to this area (and other western rural areas that have experienced growth in mining employment) is the rate of growth since 1980. In 1980 personal income for mining overall (data for metal mining only were unavailable) represented 10% of all income for the two-county area. With mining contributing 1.8% to statewide employment during that time, Elko and Eureka counties had a combined location quotient of 5.7 in 1980. So at a time when the statewide and westwide economies have been growing more diversified, the Elko-Eureka counties area has become more dependent on mining.

Description of Mining Operations

The wide variety of mining and milling methods depends on the type of mineral mined and physical properties of the deposit. Representing all of these variations in one programmatic study would be difficult. Appendix E contains a description of four "typical" operations for exploration and placer, open pit, and strip mining. These descriptions are not meant to represent an entire industry using a particular method but instead are meant to represent "typical" operations that could reasonably be expected on public lands. Also, exploration, placer, open pit, and strip operations are the most common types of mining activities for locatable minerals on public lands. These models describe the mining method, mineral deposit, size of operation, mine life, and other characteristics. The purpose of the models is to further describe how operations might be affected and the costs they might result from the proposed regulation changes and alternatives.

Use and Nonuse Values

In addition to economic activity of public lands mining, the value of nonmining environmental resources, amenities, and uses is also important. The types of resources and amenities that could be considered in an economic impact analysis of mining regulations could be quite extensive. For example, impacts to the following all have economic implications: fish and wildlife populations, habitat, water quantity and quality, recreation, scenic quality, endangered species, ecosystem functions, biodiversity, and air quality.

Most of these resources have more than one type of value, generally called "use" and "nonuse" values, sometimes referred to as nonmarket economic values. Use value refers generally to consumption value, for example, the economic value (e.g. expenses) of hunting elk or hiking in a wilderness area. Nonuse value is independent of use. Nonuse values might consist of the value one may place on preserving a population of endangered species or on preserving a scenic view for future generations (Freeman 1993).

Use values are generally observed through the activities of markets where prices are set for goods and services. Nonuse values can be defined "... as an individual's willingness to pay to preserve or maintain a resource..." beyond what he has already paid for that resource in the market (Freeman 1993). For environmental resources and amenities, markets in many cases do not exist or are not well defined. Consequently, use and nonuse values are difficult to determine.

Wildlife-related recreation serves as one good example of the value of environmental resources and amenities. A recent survey by the U.S. Fish and Wildlife Service estimated that expenditures for hunting, fishing, and wildlife viewing in 1996 totaled nearly $9 billion in the study area (FWS and Bureau of the Census 1997). Expenditures include lodging, transportation, and eating expenses, purchases of hunting and fishing equipment, binoculars, and a wide variety of other expenses. Expenditures by state are listed in Table 3-30.

Table 30. Expenditures for Wildlife-Related Recreation in Study Area 1996 ($000)

Alaska	$781,000
Arizona	1,029,000
California	2,397,000
Colorado	792,000
Idaho	146,000
Montana	219,000
Nevada	263,000
New Mexico	429,000
Oregon	693,000
Utah	237,000
Washington	1,661,000
Wyoming	235,000
TOTAL	$8,882,000

Source: FWS and Bureau of the Census 1997.

These recreation expenditures are one example of use value for fish and wildlife. Other use values that should be considered for fish and wildlife include commercial production such as commercial fisheries, and subsistence value, the value to American Indians of fish and wildlife for noncommerical uses (Flather and Hoekstra 1989; BLM 1988b).

Nonuse values, which are independent of expenditures, take various forms, such as option value (the value a person places on a resource to preserve it for possible future use), existence value (the value a resource has even though the person will never use it), or bequest value (the value a person places on a resource to preserve it for future generations). The sum of use value and all nonuse values for a particular resource is that resource's total value (Freeman 1993).

Recognition of both use and nonuse values for environmental resources is important, but quantifying these values for all the nonmining resources in this EIS would be difficult at best for several reasons. First, data for many resources are either unavailable or available on only a site-specific basis. Second, the number of resources and amenities to consider is large. Third, the study area is large. Fourth, because "markets" do not exist for many of these resources (as, for example, a plant or insect that may have no apparent current value, but a valuable use may be discovered for it in the future), data on their values is virtually impossible to determine. But the EIS does consider the impacts of the regulations and alternatives to environmental conditions for a wide variety of resources. In that sense, this EIS does portray the *trade-offs* between mining activity and environmental conditions across the alternatives.

Environmental Consequences

Introduction

Appendix E details the analysis used to estimate changes in overall mining activity for each of the alternatives. Additionally, it provides mine cost models detailing how the cost structures and requirements for four typical mining operations might be affected by each of the four alternatives. These scenarios are hypothetical and are provided for descriptive purposes only. They are not meant to portray any particular mining operation or any specific state's permitting process. They should be viewed as simply illustrative of changes a mining operation might experience under these alternatives.

Alternative 1: No Action

The No Action Alternative is not expected to have any overall effects on trends in mineral exploration and development as described in the previous section. Over the long term, exploration for and development of precious metals, particularly gold, are expected either to continue at levels of the recent past or to slightly increase. This projection assumes that the price of gold stabilizes above $300/ounce over the long term. However, the current gold market is characterized by low prices (which have persisted for about 2 years) relative to the past 20 years coupled with lower than anticipated demand from Southeast Asia due to that region's economic problems. Consequently, the short-term outlook for gold production remains uncertain. For base metals, particularly copper, production is expected to increase slowly but steadily over the foreseeable future. For production of industrial minerals, the western United States will likely see an increase in activity overall on all types of land ownerships including public lands. The overall projections in production activity for precious, base, and industrial minerals are based on trends in those commodity markets and do not necessarily coincide with the anticipated number of future Notices and Plans of Operations.

Alternative 2: State Management

Overall, it is estimated that mining activity over the long term could increase across the study area up to 5% from current levels after full implementation of the State Management Alternative. Changes in performance standards and environmental review for some states would be the primary drivers of increased activity for most types of small operations (e.g. exploration, placer, open pit, and underground) as well as for large underground and for most industrial mineral mining. For larger operations (especially exploration, placer, and open pit) changes in administrative requirements and changes in performance standards would be more evenly split in their impacts on operations.

There would be no BLM review or approval of any specific project because BLM would defer all regulation of exploration and mining activities to the respective states. Administrative elements likely to have the greatest effect are the content and processing requirements for Notices and Plans of Operations and the 5-acre threshold for Plans of Operations, since BLM would no longer require Notices and Plans. Time delays due to preparing environmental impact statements (EISs) would be reduced or eliminated in most states. But California and Montana have state laws similar to the federal National Environmental Policy Act (NEPA), under which EISs would still be prepared. In these two states there would likely be little time advantage to implementing this alternative.

Assuming a 5% increase in mining, the value of mine production of locatable minerals would increase by an estimated $91 million across the study area. This level of increased production would contribute 1,150 more jobs to the region, $167 million more in total industry output, $75 million more in total personal income (of which $41 million would be employee compensation), and $85 million more in value-added (see Table 3-31). For the study area's total current value-added as measured by gross state product (GSP), this amount represents a 1% increase in the metals and nonmetallic sectors. Most states would likely see increased levels of activity on public lands. But on the basis of the current level of production, Nevada is estimated to produce the largest increase ($93 million in industry output), more than half the gain for the study area as a whole.

These economic impacts assume a 5% increase in activity overall. States, such as Montana and California, that have National Environmental Policy Act-type review provisions might not realize an increase because there would likely be no time advantage for this alternative. Also, some states have environmental protection regulations similar enough to the 3809 regulations that mining might not realize significant cost reductions.

The estimated increase in overall production would result from a variety of responses by the mining industry, holding constant other factors (e.g. technology, commodity prices, and political and economic conditions for mining in other countries). Some deposits considered to be subeconomic might under the State

Management Alternative be considered economically feasible with a higher likelihood for development, either as extensions of existing mines or as new mining operations. Or more new operations might come on-line due to increased exploration or lower costs for obtaining permits.

Commodity prices would not be likely to change in response to a 5% overall increase in production because prices for most mineral commodities are determined on world markets and individual production decisions do not affect prices. For commodities whose prices are not determined on world markets (such as some of the industrial minerals) it is assumed that the prices are established on local markets and increases in production from public lands would not be sufficient to affect these prices.

Rural communities might or might not be affected, depending on a variety of factors: the level of current local mining; a community's degree of dependency or "specialization" in mining subject to the 3809 regulations; and the size of the community, its isolation, and other factors. Except for Nevada, small rural communities in most states are expected to experience only a small increase in number of jobs and output relative to overall employment and output levels. Increases might be due to expanding existing operations or starting new operations. Small expansions or small new mines might little affect communities whose population and labor force are already in place to fill new jobs. Smaller, more-isolated communities experiencing a new mine might suffer "growing pains" and new demands on local services from a large influx of new workers and their families.

In Nevada, impacts to rural communities might be greater than in other states due to the greater estimated increase in activity (550 jobs and $93 million in industry output). But again, the impact to any particular community in the state would depend on whether the impact is due to expansions of existing operations or entirely new operations. Many of the more established communities (e.g. Elko/Eureka Counties, Humboldt County) might be better equipped to handle an influx of new jobs of this magnitude since they have had more experience with mining-induced growth over the past 20 years. Nevertheless, significant impacts might result.

The estimates of impacts assume full implementation of the alternative and no significant changes in current state requirements. Any impacts at the community level would not likely occur in the short term since new mining operations and expansions would take some time to come online.

Alternative 3: Proposed Action

Under the Proposed Action, mining activity across the study area could decrease by up to 5% from current levels after full implementation of this alternative, and assuming current trends in mining continue for the foreseeable future. For most types of operations (i.e. exploration, placer, small open pit, and underground), the main components of the proposed regulations affecting mining would be new administrative requirements designed to increase resource protection. (The exception is for large open pit mines, which are expected to be affected more heavily by performance standards than by administrative-type provisions).

For example, some small operations (especially those employing cyanide processes) that currently have to file only a Notice would under the Proposed Action be required to

Table 3-31. Alternative 2 (State Management) Estimated Total Regional Economic Impacts from Production of Locatable Minerals on Federal Lands ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Employment (Jobs)
			Total	Employee Compensation		
Alaska	$48,100	$55,400	$26,000	$12,000	$33,000	400
Arizona	60,900	56,400	28,000	16,700	$33,000	450
California	162,000	246,000	131,000	79,500	143,000	1,750
Colorado	34,100	49,400	24,400	13,900	28,900	300
Idaho	63,000	83,800	43,200	25,700	49,700	700
Montana	64,500	90,500	42,200	26,400	54,300	600
Nevada	1,270,000	1,960,000	898,000	504,000	982,000	11,600
New Mexico	11,900	13,900	5,150	2,420	6,930	100
Oregon	1,920	1,160	840	525	945	<25
Utah	163,000	114,000	45,900	24,300	56,700	800
Washington	26,300	29,300	17,300	11,200	19,500	200
Wyoming	5,090	3,470	1,790	840	2,420	50
Study-Area Total	$1,910,000	$3,510,000	$1,570,000	$860,000	$1,790,000	24,000

Estimated Change in Regional Economic Activity from Current Conditions ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Employment (Jobs)
			Total	Employee Compensation		
Alaska	$2,300	$2,640	$1,240	$570	$1,570	<25
Arizona	2,900	2,690	1,340	795	1,560	<25
California	7,710	11,700	6,230	3,790	6,810	100
Colorado	1,630	2,350	1,160	660	1,380	<25
Idaho	3,000	3,990	2,060	1,230	2,370	50
Montana	3,070	4,310	2,010	1,260	2,590	50
Nevada	60,300	93,300	42,700	24,000	46,800	550
New Mexico	568	660	245	115	330	<25
Oregon	91	55	40	25	45	<25
Utah	7,780	5,410	2,190	1,160	2,700	50
Washingto	1,250	1,400	825	535	930	<25
Wyoming	242	165	85	40	115	<25
Study-Area Total	$90,800	$166,000	$74,800	$41,000	$85,300	1,150

Notes: Figures rounded to three significant digits. Employment figures rounded to nearest 50, except figures under 25. Source: IMPLAN Input-Output Modeling System.

submit a Plan of Operations. This requirement would increase the workload, time, and cost of obtaining approval for mining. But the degree to which these factors (workload, time, and cost) would increase would depend on the type of operation and the reason a Plan would be required instead of a Notice. In addition, new filing requirements for Plans of Operations, such as more data, would increase costs for data collection and possibly take more time than currently is the case. Timing delays would also be more likely for operations that would fall within withdrawn areas due to the need for validity examinations for mining claims before BLM would approve mining permits.

New requirements for bonding constitute

another administrative area that would increase costs for smaller, Notice-level operations. Although new bonding requirements would affect all types of operations, those most affected would be small operations (e.g. placer, small open pit, and underground). These impacts would mainly be due to bonding amounts and the requirement that the bond instrument be filed with BLM.

Generally, the performance standards under the proposed regulations are expected to have a relatively smaller impact on future operations than the administrative-type provisions. Of the performance standards, provisions for pit backfilling (which would affect both small and large open pit mines) have the greatest potential for affecting open pit operations. Other performance standards, especially those addressing leaching operations, surface and ground water protection, and acid-forming-type materials, are also expected to have affect operations, although not to the same degree as pit backfilling. Standards for revegetation and protection and restoration of fish and wildlife habitat are expected to have their greatest impact on small exploration projects and small placer mining.

The value of mine production originating from public lands under the Proposed Action is assumed to decrease by an estimated 5% or $91 million across the study area. This level of decreased production would cause the following decreases: 1,150 jobs to the region, $167 million in total industry output, $75 million in total personal income (of which $41 million is employee compensation), and $85 million in value-added (see Table 3-32). For the study areas's total current value-added as measured by gross state product (GSP), this $85 million would represent a 1% decrease in GSP-related value in the metals and nonmetallic sectors.

Most states would see decreased levels of mining on public lands, ranging from $55,000 in Oregon to $93 million in Nevada. Nevada's share of the loss would be more than half of the loss for the study area as a whole. Nevada's existing regulations, however, already incorporate most of the provisions of the Proposed Action, so the estimated 5% decline in that state's production might be overstated.

A 5% decline overall in mineral production from current levels would result from a variety of responses by the mining industry. Some potential future operations would now be considered subeconomic and therefore would not be developed. Future operations might have shorter mine lives. Or current operations that might expand under these new regulations might close sooner than they otherwise would, holding constant other factors (e.g. technology, commodity prices, and political and economic conditions for mining in other countries). A lower level of exploration due to more restrictions would also tend to decrease opportunities for future development, so some deposits would not even be found.

Economic theory suggests that mines would cease production when operating costs exceed gross revenue. The specific effects on any particular firm are difficult to determine without detailed information about that firm's production costs, capital structure, and nature and extent of its activities. In the extreme case, however, some firms could decide to cease production, either permanently or until commodity prices rise enough to make production profitable. But existing operations would be "grandfathered" and would continue to operate under existing regulations. Regulations under the Proposed Action would apply only to future plans to expand existing operations, and most current operations would be unaffected.

This analysis is based on BLM's best estimates of potential overall reductions in the level of production of mineral commodities and estimates of increased costs borne by firms. But aggregate levels of output might not change, given more efficient mining and reclamation techniques or other changes in market conditions. Total quantity produced could remain unchanged. Alternatively, the regulatory cost burden imposed by the proposed regulations could be overwhelmed by other market forces—such as commodity prices—that might play a relatively more important role in miners' production decisions.

Further, the regulations would not be

implemented in a static environment. Both miners and BLM would probably become more efficient in meeting the requirements of the regulations over time. In the long run the regulations might even create incentives for firms to seek new lower cost approaches to mining and reclamation. This is a reasonable assumption given the inclination most firms have to constantly seek least-cost technology and business practices. This assumption implies that the costs of the regulations could decline over time.

Commodity prices would not be likely to change in response to a 5% decline in production because the prices for most mineral commodities are determined on world markets and individual production decisions do not affect prices. For commodities whose prices are not determined on world markets (such as some of industrial minerals) prices are assumed to be established on local markets, and changes in public land production are assumed not to affect these prices.

Rural communities might or might not be affected, depending on a variety of factors: the current local level of activity; the degree of dependency or "specialization" a community may have in mining subject to 3809 regulations; and the size of the community, its isolation, and other factors. Except possibly in Nevada, small rural communities in most states would lose only a small number of jobs and output relative to overall employment and output levels. And some or all of this decrease might be due to forgone future mining rather than current operations shutting down, or closing earlier than originally planned due to a reduction in economic reserves. In other words, there might be no impact to current mining in these communities, but new operations in the future might not be developed.

In Nevada, impacts to rural communities might be greater than in other states due to the greater estimated decrease in activity (550 jobs and $93 million in industry output). But the impact to any particular community in the state would depend on whether it results from existing mines closing prematurely or potential future operations not being developed. Any impacts at the community level would not likely occur in the short term while the proposed regulations are being implemented because mines with existing permits would not be affected unless they submit amendments to their Plans of Operations. But, as previously stated, Nevada's existing regulations already incorporate most of the provisions of the Proposed Action, so the estimated 5% decline in production might be overstated.

Alternative 4: Maximum Protection

Mineral production across the study area could decrease by up to an estimated 30% from current levels after full implementation of Alternative 4, depending on mining method used. Open pit mining is expected to be affected most heavily (a decrease of 30%). Exploration is estimated to decrease by 20%, placer and underground mining by 15%, and strip mining by 5%.

Generally, the performance standards would have the greatest impact on the economy since they would most heavily affect open pit and large underground mines, which include most of the precious- and base-metal operations. Each of the performance standards would have the potential to significantly affect current and future operations, although not to the same degree. Mandatory pit backfilling, for example, would substantially increase costs for most open pit mines since most operations currently do not backfill or backfill only partially. Provisions for surface and ground water protection, and for acid-producing processes would also substantially affect open pit and underground mines, making some proposed operations unfeasible.

For a variety of reasons the administrative provisions under Maximum Protection are expected to affect placer mining, small exploration, and small underground operations relatively more than would the performance standard provisions. The administrative provisions likely to cause the greatest effects are the elimination of Notice-level operations for disturbances of less than 5 acres during a calendar year, validity exams and economic

Table 3-32. Alternative 3 (Proposed Action) Estimated Total Regional Economic Impacts from Production of Locatable Minerals on Federal Lands ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Employment (Jobs)
			Total	Employee Compensation		
Alaska	$43,500	$50,200	$23,600	$10,800	$29,800	350
Arizona	55,100	51,000	25,400	15,100	29,600	400
California	146,000	222,000	118,000	71,900	129,000	1,550
Colorado	30,900	44,700	22,000	12,500	26,100	250
Idaho	57,000	75,800	39,000	23,300	44,900	650
Montana	58,400	81,900	38,200	23,800	49,100	550
Nevada	1,150,000	1,770,000	812,000	456,000	889,000	10,500
New Mexico	10,800	12,500	4,660	2,190	6,270	100
Oregon	1,740	1,050	760	475	855	<25
Utah	148,000	103,000	41,500	21,900	51,300	700
Washington	23,800	26,500	15,700	10,200	17,700	150
Wyoming	4,610	3,140	1,620	760	2,190	50
Study-Area Total	$1,730,000	$3,170,000	$1,420,000	$778,000	$1,620,000	21,700

Estimated Change in Regional Economic Activity from Current Conditions ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Employment (Jobs)
			Total	Employee Compensation		
Alaska	($2,290)	($2,640))	($1,240)	($570)	($1,570)	(<25)
Arizona	(2,900)	(2,690)	(1,340)	(795)	(1,560)	(<25)
California	(7,710)	(11,700)	(6,230)	(3,790)	(6,810)	(100)
Colorado	(1,630))	(2,350)	(1,160)	(660)	(1,380)	(<25)
Idaho	(3,000)	(3,990)	(2,060)	(1,230)	(2,370)	(50)
Montana	(3,070))	(4,310)	(2,010)	(1,260)	(2,590)	(50)
Nevada	(60,300)	(93,300)	(42,700)	(24,000)	(46,800)	(550)
New Mexico	(568)	(660)	(245)	(115)	(330)	(<25)
Oregon	(91)	(55)	(40)	(25)	(45)	(<25)
Utah	(7,780)	(5,410)	(2,190)	(1,160)	(2,700)	(50)
Washington	(1,250)	(1,400)	(825)	(535)	(930)	(<25)
Wyoming	(242)	(165)	(85)	(40)	(115)	(<25)
Study-Area Total	($90,800)	($167,000)	($74,800)	($41,000)	($85,300)	(1,150)

Notes: Figures rounded to three significant digits. Employment figures rounded to nearest 50, except figures under 25. Source: IMPLAN Input-Output Modeling System.

feasibility analyses, bonding requirements, and the requirement that all existing operations must comply with the provisions of this alternative (no "grandfather" provision).

The requirement to submit a Plan of Operations regardless of potential acreage disturbed would affect most current small operations and all potential future operations that would otherwise have filed a Notice under the existing regulations. These operations would be required to provide a greater level of information, would be subject to greater agency and public involvement, and would have to obtain agency approval before proceeding. The requirement to conduct validity exams and economic feasibility analyses would affect all types of proposed operations except for exploration. This requirement would cause permitting delays and impose more analysis costs on both the agency and applicants.

Bonding for unplanned events could also add substantial costs to some operations. The "no grandfathering" provision would potentially have a large effect on a substantial number of existing operations, mainly large metal mining operations. But the provision also allows for some exceptions for technical, environmental, safety, or economic reasons.

The performance standards are expected to affect open pit mining and large exploration and large underground operations relatively more than would the administrative provisions. Although all performance standards are expected to affect operations, probably the greatest relative impact would be due to mandatory pit backfilling, water treatment provisions, and unsuitability criteria for certain mineral deposits.

Overall, under the Maximum Protection Alternative, the value of mine production of locatable minerals would decrease by $520 million across the study area. This level of decreased production would cause the following decreases: 6,900 jobs, $1 billion in total industry output, $449 million in total personal income (of which $246 million is employee compensation), and $512 million in value-added (see Table 3-33). For the study areas's total current value-added as measured by gross state product (GSP), this $512 million would represent a 7% decrease in GSP-related value in the metals and nonmetallic sectors.

All states would face decreased levels of activity on public lands, but to differing degrees depending on the mining method most prevalent in the state. The estimated 30% decrease in activity overall assumes all mine production comes from open pit operations. Of the total value of production currently produced from federal land, gold production makes up 87% ($1.5 billion in gold production out of $1.8 billion for all minerals), and most of this gold production comes from open pit mining, which would be the mining method most heavily affected by Maximum Protection. But most of this gold production is concentrated in just a few states.

Although open pit mines are located in most states, six states are likely to be affected the most: Arizona, Colorado, Montana, Nevada, New Mexico, and Utah. In these states, production levels are estimated to decline by 30% from current levels. The other states would be affected to lesser but varying degrees. Impacts listed in Table 3-33 reflect these differences.

In Alaska, most current production from BLM-administered lands comes from placer mining, which would decrease by 15%, or $6.9 million, from current levels. Production in California would decrease by 25% ($38.5 million) due to a greater level of industrial mineral production relative to open pit production. Industrial minerals production mainly uses strip mining methods, which would be subject to fewer restrictions than open pit methods. In Idaho, production would decrease by 20% overall, or $12 million. This amount reflects Idaho's mix of open pit and underground operations. Idaho tends to have a greater proportion of underground mines than the study area overall, and underground mines would be less affected than open pit mines. In Oregon and Wyoming most production involves industrial minerals, which are mainly extracted by strip mining methods. The estimated decrease in production for both states is 5% ($91,000 in Oregon and $242,000 in Wyoming). In Washington the production would decrease by 20% ($5 million), given its mix of open pit metals operations and industrial minerals operations, which are more apt to use strip methods.

Nevada, with its concentration of open pit gold mines, would face the greatest reduction in activity, a $362 million decrease in production value. This decrease would create a $560 million decrease in industry output and a loss of 3,300 jobs.

Across the study area, a decline of up to 30% overall in mineral production, depending on mining methods, would result from a variety of responses by the mining industry. Because of the "no grandfather" provision, many current operations might close down if they could not comply with the provisions of the Maximum Protection Alternative, although the provision does allow some exceptions for technical, environmental, safety, or economic reasons. Some potential future operations would then be considered subeconomic and would not be developed. Future operations might have shorter mine lives. Or current operations that might expand under these new regulations might close sooner, holding constant other factors (e.g. technology, commodity prices, and political and economic conditions for mining in other countries).

The level of decrease in activity assumed under Alternative 4 would also likely cause decreased exploration in the study area for two reasons. First, exploration would be directly affected by the provisions of this alternative. All exploration projects would be required to file Plans of Operations and meet the provisions of the performance standards. These provisions could substantially increase exploration costs and thus decrease activity. Second, and possibly more important, the expected decrease in mining due to more restrictive performance and design standards would decrease the desirability of exploring for new or expanded deposits in the study area. Consequently, exploration on non-BLM-administered lands or foreign countries might become relatively more attractive.

Rural communities where locatable minerals are now being mined could also be substantially affected. Because existing operations would not be "grandfathered," many of these operations could incur significant costs to comply with the provisions of this alternative. Where operations could absorb these costs, mines lives might be shortened if portions of the ore deposit become uneconomic and higher graded deposits could not be found. Other operations could not absorb these costs and would shut down completely.

The extent to which communities would be affected would depend on a variety of factors: the level of local current activity; the community's dependence on mining subject to 3809 regulations; whether existing operations could meet the more restrictive requirements; and the size of the community, its isolation, and other factors. In small, isolated communities with a high degree of specialization in mining, the impact of a mine shutting down would be significant. Larger communities with a lesser degree of specialization in mining would be less affected. Nevada communities would have the greatest potential for significant impact given the high degree of specialization in metal mining, the type of mining likely to be affected most.

The extent to which commodity prices might be affected under Maximum Protection is unknown. Gold production is likely to be most heavily affected because most gold production on public lands comes from open pit mines. An estimated 40% of all domestic gold production comes from federal land (including land managed by agencies other than BLM), with a estimated value of $1.6 billion (see Table 3-33). A 30% decrease of this 40% means total domestic production would decrease by 13%. A 13% decline in domestic production would translate to a 2% decrease in worldwide production at current worldwide production levels. Given the current projections for the rate of growth in production worldwide (1.3% to 3% per year), a 2% decline may fall within this range of variability. Further, this projection assumes no other changes in the factors affecting the gold market, such as commodity prices, demand, or technological changes.

Prices for other commodities are not likely to be affected for a two reasons: (1) A lower proportion of total domestic production comes from BLM-administered land for most of these minerals, and (2) these minerals use a wide variety of mining methods and rely less on open pit methods for extraction.

Table 3-33. Alternative 4 (Maximum Protection) Estimated Total Regional Economic Impacts from Production of Locatable Minerals on Public Lands ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Employment (Jobs)
			Total	Employee Compensation		
Alaska	$39,000	$44,900	$21,100	$9,690	$26,700	300
Arizona	40,600	37,600	18,700	11,100	21,800	300
California	116,000	175,000	93,400	56,800	102,000	1,250
Colorado	22,800	32,900	16,200	9,240	19,300	200
Idaho	48,000	63,800	32,900	19,600	37,800	550
Montana	43,000	60,300	28,100	17,600	36,200	400
Nevada	844,000	1,310,000	598,000	336,000	655,000	7,750
New Mexico	7,950	9,240	3,430	1,610	4,620	50
Oregon	1,740	1,050	760	475	855	<25
Utah	109,000	75,700	30,600	16,200	37,800	550
Washington	20,000	22,300	13,200	8,560	14,900	150
Wyoming	4,610	3,140	1,360	640	1,840	<25
Study-Area Total	$1,300,000	$2,340,000	$1,050,000	$573,000	$1,190,000	16,000

Estimated Change in Regional Economic Activity from Current Conditions ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Employment (Jobs)
			Total	Employee Compensation		
Alaska	($6,880)	($7,920)	($3,720)	($1,710)	($4,710)	(50)
Arizona	(17,400)	(16,100)	(8,010)	(4,770)	(9,360)	(100)
California	(38,500)	(58,500)	(31,100)	(18,900)	(34,100)	(400)
Colorado	(9,760)	(14,100)	(6,960)	(3,960)	(8,250)	(100)
Idaho	(12,000)	(16,000)	(8,220)	(4,900)	(9,460)	(150)
Montana	(18,400)	(25,900)	(12,100)	(7,530)	(15,500)	(150)
Nevada	(362,000)	(560,000)	(256,000)	(144,000)	(281,000)	(3,300)
New Mexico	(3,410)	(3,960)	(1,470)	(690)	(1,980)	(50)
Oregon	(91)	(55)	(40)	(25)	(45)	(<25)
Utah	(46,700)	(32,400)	(13,100)	(6,930)	(16,200)	(250)
Washington	(5,000)	(5,580)	(3,300)	(2,140)	(3,720)	(50)
Wyoming	(242)	(165)	(340)	(160)	(460)	(<25)
Study-Area Total	($520,000)	($1,000,000)	($449,000)	($246,000)	($512,000)	(6,850)

Notes: Figures rounded to three significant digits. Employment figures rounded to nearest 50, except figures under 25. Source: IMPLAN Input-Output Modeling System.

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Chapter 4
Consultation and Coordination, Public Participation, and Preparers

Consultation and Coordination

No cooperating or joint lead agencies participated in preparing this EIS. BLM coordinated with state governments, state regulatory agencies, American Indian tribal governments, and other federal agencies, including the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and the Bureau of Indian Affairs, in developing the proposed regulations and preparing the draft EIS.

The importance of federal-state consultation and coordination was established at the beginning of this effort to review and revise the 43 CFR 3809 regulations. In his January 6, 1997, in a memorandum directing the Bureau of Land Management to start the rulemaking process, the Secretary of the Interior directed that "Coordination with state regulatory programs should be carefully addressed, to ensure that Federal Land Policy and Management Act's purpose of avoiding unnecessary or undue degradation is achieved, while minimizing duplication and promoting cooperation among regulators."

BLM started working closely with the governors and state agencies of the "Mining Law" states before issuing the Notice of Intent to Prepare an EIS and continued this consultation through the issuance of the Notice of Availability for the draft EIS. The importance of this consultation and coordination was reiterated in the 1998 Interior Appropriations Act, which directed the Secretary of the Interior to certify that he had consulted with the affected states. On April 8, 1997, March 3, 1998, and again on September 22, 1998, the BLM team drafting the regulations participated in meetings hosted by the Western Governors' Association. These meetings with representatives of western state governments and government agencies focused on their concerns about the concepts and provisions in the working drafts of the proposed regulations. Written comment on the drafts of the proposed regulations were also solicited from the individual states. The Western Governors' Association was a conduit to facilitate much of the consultation with the states. Both Department of the Interior and BLM officials directly contacted affected state governors and state regulatory agencies.

To obtain input from American Indians, BLM consulted and coordinated with the Bureau of Indian Affairs, the Native American Indian Congress, and tribal governments. Key points of consultation and coordination included a presentation to the Indian Minerals Steering Committee by Robert Anderson, Deputy Assistant Director for Minerals, Realty, and Resource Protection. Preliminary draft regulations were also distributed to potentially affected tribal governments. An information briefing/public meeting was also held on the Fort Belknap Indian Reservation in Montana.

While developing the proposed regulations and preparing the draft EIS, BLM consulted informally with the U.S. Fish and Wildlife Service and U.S. National Marine Fisheries Service on the proposed regulations. Before issuing the final EIS a determination will be made on the need for formal consultation on this rulemaking. Before authorizing surface disturbance actions under the 3809 regulations, site-specific consultation can be required in compliance with Section 7 of the Endangered Species Act.

Before authorizing surface disturbance, BLM would consider the effects of the site-specific proposal on cultural resources that are listed or eligible for inclusion on the National Register of Historic Places through the consultation process in Section 106 of the National Historic Preservation Act of 1966.

Public Participation

The EIS public participation process consists of several phases. Public participation begins with scoping, which is conducted to help determine issues and select alternatives for analysis before any decisions are made. Information gathered during scoping is analyzed and used in determining the issues to be addressed and the alternatives to be presented in detail in a draft EIS.

A draft EIS is subject to further public review and comment during the public comment period. Following the comment period, a final EIS is prepared. The final EIS will consider and incorporate any other comments received during the review period.

Encouraging public involvement throughout the process ensures that the process is open and considers information from all interested parties, including other federal agencies; state and local governments; American Indian tribal governments; the scientific community; professional, conservation, and trade organizations; public land users and stakeholders; and citizens at large.

In January 1997 the Secretary of the Interior directed BLM to continue with the regulation review process promised in 1981 and begun in 1991. Because of the time that had passed since the 1991 effort, BLM started a new public participation process in early 1997 and requested comments from its field offices on the existing regulations and suggestions for improvement. Public participation was encouraged by prescoping outreach to special interest groups and government officials; scoping for the EIS, including a formal 81-day comment period and 19 public meetings in 12 cities, and placing working drafts of the proposed regulations on BLM's internet web site. Formal 60-day comment periods for this EIS and the proposed 43 CFR 3809 regulations provide further opportunities for public participation and commentary. Issues, concerns, and alternatives identified through scoping are discussed in Chapter 1.

Outreach

In March 1997 BLM issued a press release to announce the revision effort and formed a task force of agency people with experience in the program to coordinate public involvement, develop regulation options, and to oversee the preparation of an EIS on the effect of any changes in the regulations. From March through May BLM conducted briefings on the revision process for conservation and industry groups; congressional offices; and local, state and federal government agencies. Although this outreach effort occurred before and not as part of the formal scoping process, BLM considered the views expressed in developing the proposed rules and draft EIS.

Beginning in April 1997, information packages were sent to all BLM offices for distribution to the interested public. These information packages contained the Secretary's January 1997 letter initiating the regulation review, a briefing summary of the development of the current regulations and associated policies, the proposed regulation and EIS schedules, and an explanation of the proposed process for reviewing and revising the regulations and developing the EIS. These information packages were mailed to interested or affected stakeholders, given out at BLM offices, and distributed at meetings with interest groups. In addition, a summary of the scoping comments from the aborted 1991 reform effort was given to interested parties.

Scoping

An extensive public scoping process was conducted for the draft EIS. On April 4, 1997 a Federal Register notice announced BLM's intent to prepare an EIS, requested scoping comments, and gave the schedule for public scoping meetings. BLM also issued national and local news releases announcing the scoping process. To collect a wide range of comments, public scoping or informational meetings were held at the locations shown in Table 4-1.

Table 4-1. Informational and Scoping Meetings for the Draft EIS

Date (1997)	Location	Approximate Attendance
May 13	Spokane, WA	40
May 13	Denver, CO	125
May 15	Fairbanks, AK	65
May 15	Phoenix, AZ	142
May 20	Casper, WY	22
May 20	Reno, NV	233
May 20	Socorro, NM	15
May 22	Washington, DC	80
May 28	San Francisco, CA	68
May 28	Helena, MT	132
May 28	Salt Lake City, UT	70
June 16	Eugene, OR	40

The deadline for providing scoping comments was ultimately extended through June 23, 1997, although the record remained open until the proposed regulations were being finalized in the fall of 1998. In addition to oral comments at public meetings, 1,832 comment letters (including email messages) were submitted on revising the 3809 regulations.

To establish a framework for the scoping process BLM selected eight topics that had previously been listed as program issues: (1) the definition of unnecessary or undue degradation, (2) the development of specific performance standards for mining and reclamation, (3) the 5-acre disturbance threshold between a Notice- and Plan-level operations, (4) coordination between state and federal regulators, (5) the type and adequacy of penalties for violating regulations, (6) the review timeframes for Notices and Plans of Operations, (7) the definition of casual use, and (8) requirements for reclamation bonding. Participants were also invited to comment on any other issues of concern in the surface management program.

A comment analysis team was formed to review the comments. In summarizing the scoping comments the team grouped them by (1) comments concerning the eight issue topics originally selected by BLM, (2) comments that raised new issues, (3) comments with suggestions for preparing the EIS, and (4) comments on the scoping process itself. In addition, comments by BLM field office staff were grouped as such. The results of the comment analysis were given to the two teams working on the regulations and the draft EIS. In September 1997 a scoping report summarizing the comments received through June 23, 1997 (BLM 1997a) was distributed to all who submitted comments or expressed an interest in the rulemaking or EIS.

In February 1998 BLM requested reviews and comments on an initial working draft of the proposed regulations from federal, state, local, and tribal officials. In addition, the draft was released for public review. In response to comments, BLM prepared a second draft and posted it on the internet on August 11, 1998. BLM's internet homepage was updated regularly to give users the latest information on working drafts of the regulations, schedules, and other salient information on the project. As of November 17, 1998 there were 12,879 visits to the internet web site. From the end of the comment period on June 23, 1997 through the publishing of the Notice of Availability for the draft EIS, BLM received more comment letters and messages. Comments received after June 23, 1997 have also been reviewed by the Regulation Team and the EIS Team.

Distribution

The draft EIS, along with the proposed rules (see Appendix B), were released for public review and comment during a 60-day public comment period. One copy of the draft EIS was mailed to each person and organization that provided comments during scoping or expressed an interest in the rulemaking or EIS. In addition, copies of the draft EIS have been sent to organizations that may not have submitted comments: congressional offices; federal, state, and local agencies; tribal governments; and conservation and trade organizations. Appendix H lists recipients of the draft EIS. Copies of the EIS and the regulations have also been posted on BLM's internet web site.

Additional Actions

The final EIS will incorporate comments and changes resulting from the public comment period. The availability of the final EIS will be announced in the Federal Register. No sooner than 30 days after publication of the final EIS, the Secretary of the Interior will issue a record of decision. At the same time, on the basis of that record of decision, the final rules will be published in the Federal Register.

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We wish to thank BLM's Arizona State Office, Office of External Affairs, and the National Training Center for their help in preparing this EIS. Judy McDonald of the National Training Center prepared the maps and illustrations, Beth Perault of the Arizona State Office designed and laid out the document, and Dorothea Boothe of the Arizona State Office arranged for and coordinated the document's printing and distribution.

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Glossary

ACCELERATED EROSION: Soil loss above natural levels resulting directly from human activities. Because of the slow rate of soil formation, accelerated erosion can lead to a permanent reduction in plant productivity.

ACID ROCK DRAINAGE (ARD) (ACID MINE DRAINAGE): The exposure, usually as a result of mining, of sulfide-bearing minerals to air and water, forming sulfuric acid. This acid dissolves metals such as lead, zinc, copper, arsenic, selenium, mercury, and cadmium, into ground and surface water. Acid rock/mine drainage can poison ground and drinking water and destroy aquatic life and habitat. Commonly mined ore bodies that pose the risk of acid rock drainage include gold, silver, copper, iron, zinc, and lead.

ACUTE TOXICITY: Any poisonous effect produced by a single short-term exposure and resulting in severe biological harm or death.

ADIT: A nearly horizontal passage in an underground mine, driven from the surface, by which a mine may be entered, ventilated, or dewatered.

AGGRADATION: The building up of land surfaces by sedimentation or deposition of mineral matter.

ALEVIN: A young fish, especially a newly hatched salmon still attached to the yolk sac.

ALLUVIAL: Pertaining to material that is carried and deposited by running water.

ALLUVIAL FAN: A low, outspread, relatively flat to gently sloping mass of loose rock material deposited by a stream where it flows from a narrow mountain valley onto a plain or broad valley.

ALLUVIUM: Any sediment deposited by flowing water, as in a river bed, floodplain, or delta.

ANADROMOUS FISH: Fish, such as salmon and steelhead, that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce.

ANAEROBIC: Characterized by the absence of oxygen.

ANIMAL UNIT MONTH (AUM): The amount of forage needed to sustain one cow, five sheep, or five goats for a month.

ANNUAL VEGETATION: Plants that complete their life cycles and die in 1 year or less.

AQUATIC HABITATS: Habitats confined to streams, rivers, springs, lakes, ponds, reservoirs, and other water bodies.

AQUATIC RESOURCES: Plants and animals that live within or are entirely dependent upon water to live; living resources of aquatic habitats (fish, invertebrates, amphibians); aquatic species.

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AQUATIC SYSTEMS: A complete interacting system of organisms (aquatic species) considered together with their environment.

AQUIFER: A water-bearing bed or layer of permeable rock, sand, or gravel capable of yielding large amounts of water.

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC): A designated area on public lands where special management attention is required (1) to protect and prevent irreparable damage to fish and wildlife; important historic, cultural, or scenic values; or other natural systems or processes or (2) to protect life and safety from natural hazards.

ARID REGION: A region where precipitation is insufficient to support any but drought-adapted vegetation.

ASPECT: (1) the visual first impression of vegetation at a particular time or seen from a specific point. (2) The predominant direction of the slope of the land.

BACKFILL: Material used to replace soil and earth removed during mining.

BACKFILLING: The replacement of soil and earth removed during mining.

BACKGROUND LEVEL: The amount of a pollutant present in water or air from natural sources.

BARREN SOLUTION: A solution in hydrometalurgical treatment from which all valuable constituents have been removed. See PREGNANT SOLUTION.

BASALT: Fine-grained, dark-colored igneous rocks that are either intrusive or extrusive.

BASE FLOW: The portion of stream discharge derived from such natural storage sources as ground water, large lakes, and swamps but not derived from direct runoff or flow from stream regulation, water diversion, or other human activities.

BASE METAL: A metal inferior in value to gold and silver, a term generally applied to the commercial metals such as copper and lead.

BED LOAD: Sediment in a stream that moves by sliding, rolling, or bounding on or near the streambed.

BENEFICIATION: The dressing or processing of ores to (1) regulate the size of a desired product, (2) remove unwanted constituents, and (3) improve the quality, purity, or assay grade of a desired product. Beneficiation includes concentration or other preparation of ore for smelting by drying, flotation, or magnetic separation.

BENTHIC: Occurring or living on or in the bottom of any water body.

BENTONITE: A clay mineral formed from the decomposing of volcanic ash. Commonly bentonite can readily absorb or adsorb water and well accordingly.

BEST AVAILABLE TECHNOLOGY AND PRACTICES: The applying of the most advanced systems, techniques, procedures, and controls, determined on a case-by-case basis by the regulatory agency.

BEVILL AMENDMENT: A provision of the Solid Waste Disposal Act Amendments (1980) to the Resource Conservation and Recovery Act (RCRA) that exempted from Subtitle C requirements the wastes from the extraction and beneficiation of ores and minerals, regardless of their chemical composition. The amendment further directed the U.S. Environmental Protection Agency either to develop Subtitle C regulations for this waste or determine that this exemption should continue, and to present its findings in a report to Congress.

BIOLOGICAL ASSESSMENT: The gathering and evaluation of information on proposed endangered and threatened species and critical habitat and proposed critical habitat. Required when a management action potentially conflicts with endangered or threatened species, the biological assessment is the way federal agencies enter into formal consultation with the Fish and Wildlife Service and describe a proposed action and the consequences to the species the action would affect.

BIOLOGICAL DIVERSITY (BIODIVERSITY): The full range of variability within and among living organisms and the ecological complexes in which they occur. Biological diversity encompasses ecosystem or community diversity, species diversity, and genetic diversity.

BIOLOGICAL OXYGEN DEMAND: A measure of the oxygen used in meeting the matabolic needs of aerobic microorganisms in water rich in organic matter.

BIOMASS: The total amount of living material, plants and animals, above and below the soil surface in a biotic community.

BIOTIC COMMUNITIES: The assemblage of native and exotic plants and of a particular site or landscape, including microorganisms, fungi, algae, vascular and herbaceous plants, invertebrates, and vertebrates. These assemblages and their biotic and abiotic relationships serve landscape and watershed functions by promoting soil properties supporting water infiltration, recycling and transfer, species survival, and sustainable population dynamics.

BLOCK CAVING: A method of mining in which large blocks of ore are undercut and the ore breaks and caves under its own weight.

BUCKET-LINE DREDGE (BUCKET-LADDER DREDGE): A dredge whose digging mechanism consists of a ladderlike truss on the periphery of which is attached an endless chain that rides on sprocket wheels and on which buckets are attached.

BULKHEAD: A partition or wall in mines for protection against gas, fire, and water.

CANDIDATE SPECIES: Species not protected under the Endangered Species Act but under consideration by the U.S. Fish and Wildlife Service for inclusion on the list of federally threatened or endangered species.

CANOPY: The uppermost layer consisting of the crowns of trees or shrubs in a forest or woodland.

CARLIN TREND: An area 25 miles west of Elko in northeast Nevada that has become the most productive gold district in the United States. In this 5- by 40-mile area gold production over the past several years has exceeded 4 million ounces a year.

CARRYING CAPACITY: The maximum stocking rate possible without damaging vegetation or related resources. Carrying capacity may vary from year to year in the same area due to fluctuating forage production.

CASUAL USE: Mining activities that only negligibly disturb federal lands and resources. Casual use does not include the use of mechanized earth moving equipment or explosives or the use of motorized equipment in areas closed to off-road vehicles. Under casual use, operators do not have to notify BLM, and operations do not need to be approved. But operations are subject to monitoring by BLM to ensure that federal lands do not undergo unnecessary or undue degradation. Casual use operations must be reclaimed.

CATEGORY 1 SPECIES: Species for which the U.S. Fish and Wildlife Service has enough information on biological vulnerability and threats to support their listing as endangered or threatened species.

CATEGORY 2 SPECIES: Species for which the U.S. Fish and Wildlife Service has information suggesting the possible appropriateness for listing as endangered or threatened.

CAVE RESOURCE: Any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the earth or within a cliff or ledge, including any cave resource therein, and which is large enough to permit a person to enter, whether the entrance is excavated or naturally formed. Also included is any natural pit or sinkhole.

CHANNEL: A natural or artificial watercourse with a definite bed and banks to confine and conduct continuously or periodically flowing water.

CHANNEL MORPHOLOGY: The structure and form of a stream channel.

CHAPARRAL: A vegetation community consisting of dense and often thorny shrubs and small trees.

CHLOROSIS: The conditions of plants when chlorophyll fails to develop and plants are yellowish white to white and poorly developed.

CLIMAX VEGETATION: The final vegetation community and highest ecological development of a plant community that emerges after a series of successive vegetational stages. The climax community perpetuates itself indefinitely unless disturbed by outside forces.

COLD DESERT: Areas that are consistently dry (evaporation equals or exceeds precipitation), that have 7 or fewer months when temperatures average above 50% F, and that have average annual temperatures below 65% F.

COLLUVIAL: (1) Processes related to the slow movement of the ground (creep) due to gravity; (2) a hillside deposit developed by mass movement of rock on slopes leading away from the exposed source rock (lode).

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COLLUVIUM: Rock and soil accumulated at the foot of a slope from gravitational forces.

COMMON VARIETY MINERALS: Stone, gravel, pumice, pumicite, and cinders that, though possibly having value for trade, manufacture, the sciences, or the mechanical or ornamental arts, do not have a distinct, special value for such use beyond normal uses. On the public lands such minerals are considered saleable and are disposed of by sales or by special permits to local governments. See SALEABLE MINERALS, MINERAL MATERIALS, and UNCOMMON VARIETY MINERALS.

COMMUNITY: An assemblage of plant and animal populations in a common spatial arrangement.

COMPETENT ROCK: Rock that, because of its physical and geological character, can sustain openings without any structural support except pillars and walls left during mining.

CONE OF DEPRESSION: A change (depression) in the water table surface at the site of an active well, resulting from the withdrawal of water.

CONSUMERS: Organisms, chiefly animals, that ingest other organisms or particulate organic matter.

COOL-SEASON PLANTS: Plants whose major growth occurs during the late fall, winter, and early Spring. See WARM-SEASON PLANTS.

COUNTRY ROCK (WALL ROCK): The general mass of rock next to a body of ore, as distinguished from the vein or ore deposit itself.

COVER: Any form of environmental protection that helps an animal stay alive (mainly shelter from weather and concealment from predators).

CRITICAL HABITAT, DESIGNATED: Specific parts of an area occupied by a federally listed threatened or endangered plant or animal at the time it is listed that contain physical or biological features essential to the conservation of the species or that may require special management or protection. Critical habitat may also include specific areas outside an area occupied by a federally listed species if the Secretary of the Interior determines that these areas are essential for the conservation of the species.

CRITICAL MINERALS: Minerals essential to the national defense, the procurement of which in war, while difficult, is less serious than those of strategic minerals because they can be either domestically produced or obtained in more adequate amounts or are less essential, and for which some degree of conservation and distribution control is needed. See STRATEGIC MINERALS.

CULTURAL PROPERTY: The definite location of a past human activity, occupation, or use identifiable through field inventory, historic documentation, or oral evidence. Cultural properties include prehistoric and historic archaeological remains, or architectural sites, structures, objects, or places with important public and scientific uses.

CULTURAL RESOURCE: The fragile and nonrenewable remains of human activity that are found in historic districts, sites, buildings, and artifacts and that are important in past and present human events.

CUTTERHEAD DREDGE: A hydraulic dredge in which the suction action is augmented by a rotating propeller that operates at the point of suction. The cutterhead performs two functions: (1) it cuts into and loosens compacted soils and soft rock, and (2) it increases dredge capacity by channeling the soils into the end of the suction pipe.

CYANIDE LEACHING: The extraction of a precious metal from an ore by its dissolution in a cyanide solution.

DE MINIMUS: Of insufficient significance to warrant judicial attention.

DESERT PAVEMENT: A desert ground surface of thin, smooth, or sheetlike, wind-polished, closely packed pebbles, boulders, gravel, and other rock fragments, where wind and sheetwash have removed all small particles. These fragments are commonly cemented by mineralized solution.

DETRITUS: A nondissolved product of the disintegration or wearing away of organic or inorganic matter.

DEVELOPMENT (MINERAL): The preparation of a proven deposit for mining.

DEWATERING: The process of pumping large amounts of ground water from wells to lower the water table over a large area to allow an open pit or underground mine to operate in dry conditions.

DISCHARGE (WATER): The rate of flow or volume of water flowing in a stream at a given place or within a given period of time.

DISCOVERY: The knowledge of the presence of valuable minerals within or close enough to a location to justify a reasonable belief in their existence. Discovery is extremely important to public lands mining because the Mining Law of 1872 provides that mining claims can be located only after a discovery is made. Discovery was first legally defined in a landmark Department of the Interior 1894 land decision—Castle versus Womble. The definition, now know as the "Prudent Person Test," described a discovery as "...where minerals have been found and the evidence is of such a character that a person of ordinary prudence would be justified in the further expenditure of his labor and means, with a reasonable prospect of success in developing a valuable mine..."

DISSEMINATED ORE: Ore carrying small particles of valuable minerals spread more or less uniformly through the worthless minerals, as distinct from massive ore, in which valuable materials occur in almost solid form with little waste material included.

DRAINAGE: The removal of excess water from land by surface or subsurface flow. See ACID ROCK DRAINAGE.

DRAWDOWN, GROUND WATER: A lowering of the ground water surface caused by pumping, measured as the difference between the original ground water level and the level after a period of pumping.

DRIFT: Voluntary or accidental dislodgment of aquatic invertebrates from the stream bottom into the water column, where they move or float with the current.

ECHOLOCATION: A process used by bats for locating distant or invisible objects (prey) by detecting sound waves reflected back from the objects.

ECOLOGICAL BALANCE: The stability of an ecosystem resulting from interacting processes of its components.

ECOSYSTEM: A functioning unit of nature combining biotic communities and the abiotic environments with which they interact.

EIS STUDY AREA: The following 12 western states: Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

ELECTROWINNING: The recovery of metal from an ore by means of electrochemical processes.

ELUVIATION: A process of removal of organic material and clay in solution or in suspension from the soil by percolating waters. The removal of soil material in suspension or solution from a layer or layers of a soil. The loss of material in solution is usually called "leaching." See ILLUVIATION.

EMERGENT VEGETATION: Aquatic plant species that are rooted in wetlands but extend above the water's surface. See SUBMERGENT VEGETATION.

ENTRY: An application to acquire title to public lands.

EROSION BLANKET: Material such as straw, jute matting, or rock that is applied to the surface to minimize erosion of soil particles caused by the impact of rain drop splash and water flowing over the surface.

EVAPOTRANSPIRATION: The combined process by which water is transferred from the earth's surface (from soil, snow, water bodies, vegetation) to the atmosphere. Also see TRANSPIRATION.

EXOTIC SPECIES: An animal or plant that has been introduced from another continent. See NATIVE SPECIES.

EXPLORATION: The work of investigating a mineral deposit to determine by geological surveys, geophysical surveys, geochemical surveys, boreholes, pits, and underground workings if it is feasible to mine. Exploration is undertaken to gain knowledge of the size, shape, position, characteristics, and value of the deposit.

EXTRA LATERAL RIGHTS: Rights relating to the apex law. If a vein outcrops (apex or highest point) on the surface of a claim, the claimant of the vein's apex has rights to all of the vein that is continuous in the downward dip, including the portion of the vein outside the claim boundary.

FAIR HABITAT CONDITION: The condition of a watershed that has been moderately affected by land uses, characterized by the removal or altering in the past of natural riparian vegetation (few large trees) and the presence of only limited amounts of large woody debris, fine sediments above natural levels, some adverse changes in water quality or quantity, and habitat that has only partly recovered or is still decreasing in trend.

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FEDERAL LAND POLICY AND MANAGEMENT ACT (FLPMA): The act that (1) set out for the Bureau of Land Management standards for managing the public lands, including land use planning, sales, withdrawals, acquisitions, and exchanges; (2) authorized the setting up of local advisory councils representing major citizens groups interested in land use planning and management, (3) established criteria for review of proposed wilderness areas; and (3) provided guidelines for other aspects of public land management such as grazing.

FIRST-ORDER TRIBUTARY: A nonbranching headwater channel segment.

FISHERY: Habitat that supports the propagation and maintenance of fish.

FISH STOCK: A discrete population of a fish species that tends to inhabit the same waters and breed in the same stream.

FLOODPLAIN: Level streamside land that may be subject to flooding.

FLOW REGIMES: Characteristics of stream discharge over time. The natural flow regime is the regime that occurred historically.

FLUVIAL: Pertaining to streams or produced by stream action.

FORB: A herbaceous plant that is not a grass, sedge, or rush.

FREE WATER: Ground water free to move in response to gravity.

FUGITIVE DUST: Particulate matter emissions that do not pass through a stack, chimney, vent, pipe or similar opening.

FUNCTIONAL AT RISK (RIPARIAN-WETLAND AREAS): Areas that are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

GAINING (EFFLUENT) STREAM: A stream or reach of a stream that receives water from the zone of saturation and provides base flow; its channel lies below the water table. See LOSING STREAM.

GEOPHYSICAL EXPLORATION: The use of geophysical instruments and methods to determine subsurface conditions by analyzing such properties as specific gravity, electrical conductivity, or magnetic susceptibility.

GRANDFATHER, TO: To exempt groups or individuals from provisions of laws or regulations on the basis of preexisting conditions.

GRIZZLY: In mining, a device for the coarse screening of bulk materials.

GROSS DOMESTIC PRODUCT (GDP): The sum of the gross state products of the 50 states.

GROSS STATE PRODUCT (GSD): The sum of the gross outputs of each of a state's industries minus intermediate goods and services purchased from other industries or imported. See

INTERMEDIATE GOODS AND SERVICES.

GROUND WATER: Water that has percolated downward from the ground surface through the soil pores.

GROWTH MEDIA: See REPLACEMENT GROWTH MEDIA.

HABITAT: The natural abode of a plant or animal, including all biotic, climatic, and soil factors affecting life.

HABITAT GENERALIST: Animals that can find food and shelter in a variety of ways and can survive quite well in different habitats.

HABITAT MANAGEMENT PLAN: A site-specific wildlife habitat plan.

HARDPAN: A hardened soil layer in the lower A horizon or the B horizon caused by cementation of soil particles with organic matter or with materials such as silica or calcium carbonate.

HEAP: A large, engineered pile of ore over which chemical agents such as cyanide are sprinkled in extracting metals by heap leaching.

HEAP LEACHING: A low-cost technique for extracting metals from ore by percolating leaching solutions through heaps of ore placed on impervious pads. This method is generally used on low-grade ores.

HEAP LEACH PAD: A large impermeable foundation or pad used as a base for ore during heap leaching.

HEAVY METAL: Any of the metals that react readily with dithizone, including zinc, copper, cobalt, lead, bismuth, gold, cadmium, iron, manganese, nickel, tantalum, tellurium, platinum, and silver.

HERD MANAGEMENT AREA (HMA): The area of wild horse or burro habitat covered by a herd management area plan.

HERD MANAGEMENT AREA PLAN (HMAP): A site-specific plan that defines objectives for a herd management area and prescribes actions to meet the objectives. This plan outlines details of burro or horse capture plans, adoption programs, and long-term population management.

HIGHWALL: The unexcavated face of exposed overburden and ore in an open pit mine.

HOME RANGE: The area in which an animal travels in the scope of natural activities.

HORIZON: See SOIL HORIZON.

HOST ROCK: A body of rock with younger rocks or mineral deposits introduced into it or formed within or next to it.

HYDRAULIC CONDUCTIVITY: The property of a soil that governs the rate of ground water flow within it. The hydraulic conductivity of a particular soil is defined by the size, abundance, and geometry of its open pores, and the rate of ground water flow increases with increasing hydraulic conductivity. Fine-grained soils such as clay and silt have very small pores and have much lower hydraulic conductivities than coarse-grained soils such as sand and gravel.

HYDRAULIC GRADIENT: The slope of the free surface of water in a stream flowing in an open channel.

HYDROCARBONS: Any of a vast family of compounds containing carbon and hydrogen in various combinations, found especially in fossils fuels. Hydrocarbons in the atmosphere resulting from evaporation and incomplete combustion may be a major source of air pollution.

HYDROLOGIC BALANCE: An accounting of water inflow to, outflow from, and storage in a hydrologic unit such as a drainage basin, aquifer, lake, or reservoir; the relationship between evaporation, precipitation, runoff, and change in water storage.

HYDROSTATIC PRESSURE: The pressure exerted by the water in any given point in a water body at rest. The hydrostatic pressure of ground water is generally due to the weight of water at higher levels in the zone of saturation.

HYPORHEIC ZONE: The area where water in a stream channel has moved back into the subsurface sediments. The hyporheic zone may occur under or next to the streambed.

IGNEOUS ROCK: Rock, such as granite and basalt, that has solidified from a molten or partially molten state.

ILLUVIATION: The process of deposition of soil material removed from one horizon to another in the soil, usually from an upper to a lower horizon in the soil profile. See ELUVIATION.

INCLINE: A nonvertical mining shaft, usually of the dip of a vein.

INDEPENDENT MILLSITE: A millsite whose mill does not depend on specific mines for the minerals it processes.

INDUSTRIAL MINERALS: Rock and minerals that are not produced as sources of metals and are not mineral fuels. Examples include salt, gravels, building materials, talc, and sands.

INFILTRATION: The downward entry of water into the soil or other material.

IN SITU MINING: A method of extracting valuable minerals from ore by remobilizing or leaching them from where they occur in the ground. Under this process the ore deposit is drilled with holes in a grid pattern, and a dissolving or leaching solution is injected through the holes into the deposit, where the chemicals extract the desired minerals. The pregnant liquid is then recovered at a different well or series of wells and is piped to a recovery plant. There the minerals are recovered. The barren solution is then returned to the injection wells, and the cycle begins again.

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INTERIOR BOARD OF LAND APPEALS (IBLA): The Department of the Interior, Office of Hearings and Appeals board that acts for the Secretary of the Interior in responding to appeals of decisions on the use and disposition of public lands and resources. Because IBLA acts for and on behalf of the Secretary of the Interior, its decisions usually represent the Department's final decision but are subject to the courts.

INTERMEDIATE GOODS AND SERVICES: Goods and services that are purchased for further reprocessing and resale, as opposed to final goods and services, which are sold to ultimate users. For example, wool would be an intermediate good, whereas a wool shirt would be a final good.

INVERSION: The state of the atmosphere in which a layer of cool air is trapped near the earth's surface by an overlying layer of warm air so that the lower layer cannot rise. Serious air pollution problems may result from air pollutants being emitted into the limited mixing depth below the inversion.

INVERTEBRATES: Animals without backbones or internal bony skeletons.

JIB: The lifting arm of a crane or derrick having a pulley at its outer end over which the hoisting rope passes.

JIG: An appliance in which a vertically pulsed column of water is manipulated to stratify crushed ore with lighter particles above and heavier particles below.

KARST: A limestone area in which erosion has formed sinkholes, fissures, caverns, and underground streams.

LEACHATE: The liquid that has percolated through and dissolved minerals out of ore.

LEACHING: The separating or dissolving of soluble constituents from a rock or ore by chemical solutions or water.

LEACH PAD: See HEAP LEACH PAD.

LEASABLE MINERALS: Minerals whose extraction from federal land requires a lease and the payment of royalties. Leasable minerals include coal, oil and gas, oil shale and tar sands, potash, phosphate, sodium, and geothermal steam.

LEGAL LAND DESCRIPTION: The method of locating or describing the land in relation to the public land survey.

LEK: An assembly area where birds, especially sage grouse, carry on display and courtship behavior.

LIGNIN: The major noncellulose constituent of wood.

LITTER: The uppermost layer of organic debris on the soil surface, essentially the freshly fallen or slightly decomposed vegetal material.

LOCATABLE MINERALS: Minerals that may be acquired under the Mining Law of 1872, as amended.

LOCATABLE-TYPE MINERALS: Minerals that, if located on public lands, would be considered locatable under the Mining Law of 1872, as amended. In the Economic Conditions section of Chapter 3 of this EIS the term "locatable-type minerals" refers to mineral production from all land ownership types (federal and nonfederal). Therefore, the portion produced only on BLM-managed lands is a subset of the larger "locatable-type" category.

LOCATION: The act of taking or appropriating a parcel of mineral land, including the posting of notices, the recording thereof when required, and marking the boundaries so they can be readily traced.

LOCATION QUOTIENT: An index for comparing an area's share of a particular activity with the area's share of some basic or aggregate phenomenon.

LODE: A mineral deposit in solid rock.

LODE CLAIM: A public lands mining claim that contains valuable minerals occurring in a vein or lode.

LODE MINING: Mining of a mineral deposit in solid rock.

LOSING (INFLUENT) STREAM: A stream or reach of a stream that contributes water to the zone of saturation and develops bank storage; its channel lies above the water table. See GAINING STREAM.

MACROINVERTEBRATES: Large or exceptionally prominent animals that lack a spinal column.

MACROPHYTE: Any plant that can be seen with the unaided eye, such as aquatic mosses, ferns, liverworts, or rooted plants.

MAXIMUM CONTAMINANT LEVEL (MCL): The maximum permissible level of a contaminant in water delivered to any user of a public water system. MCLs are enforceable standards.

MAXIMUM CONTAMINANT LEVEL GOAL (MCLG): A number that is associated with no adverse health effects from drinking water containing a particular contaminant over a lifetime; a nonenforceable, ideal health goal issued as part of the National Primary Drinking Water Regulations.

METAMORPHIC ROCK: Any rock derived from preexisting rocks by mineralogical, chemical, and structural changes, essentially in the solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment at depth in the earth's crust.

METES AND BOUNDS: The boundaries of land established by reference to natural or artificial monuments along the boundaries as distinguished from boundaries established by beginning at a fixed starting point and running stated compass courses and stated distances.

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METRIC TON: 1.102 short tons or 2,204 pounds.

MICROCLIMATE: Local site-specific climatic conditions that differ from the general climate because of local differences in elevation and exposure.

MICROHABITAT: A small habitat within a larger one in which environmental conditions differ from those in the surrounding area. A hole in a tree trunk or an animal carcass is a microhabitat within a forest.

MIL: A unit of length equal to 1/1,000 of an inch.

MILL: A plant in which ore is treated for the recovery of valuable minerals or valuable minerals are concentrated into a smaller bulk for shipping to a smelter or other reduction works.

MILLSITE: A site located on nonmineral land and used for mining or milling purposes. Millsites are limited to 5 acres and may be located either by metes and bounds or by legal subdivision.

MINE DRAINAGE: Any water forming on or discharging from a mining operation. See ACID ROCK DRAINAGE.

MINERAL: Any solid or fluid inorganic substance that can be extracted from the earth for profit.

MINERAL CLAIMANT: A person, association, corporation, or government that claims minerals rights or title in the public lands.

MINERAL ENTRY: The filing of a claim on public land to obtain the right to any minerals it may contain.

MINERALIZATION: The processes taking place in the earth's crust resulting in the formation of valuable minerals or ore bodies.

MINERAL MATERIALS: Materials such as common varieties of sand, stone, gravel, pumice, pumicite, and clay, that are not obtainable under the mining or leasing laws but that can be acquired under the Mineral Materials Act of 1947, as amended. See COMMON VARIETY MINERALS.

MINERAL PROSPECT: A mineral property whose value has not been proved by exploration.

MINERAL RIGHTS: Ownership of all minerals, including all rights needed for access, exploration, development, mining, ore dressing, and transportation.

MINERAL WITHDRAWAL: A formal order that withholds federal lands and minerals from entry under the Mining Law of 1872 and closes the area to mineral location (staking mining claims) and development.

MINE TAILING IMPOUNDMENT: An area closed at its lower end by a constraining wall or dam into which mill effluents are run and from which, after solids have settled out, clear water may be returned via penstocks and piping.

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MINIMAL HABITAT CONDITION: Major alterations in a watershed, in water quality or quantity, in natural stream habitat, or in riparian areas, characterized by few or no large trees or mature native vegetation in riparian areas, little or no large woody debris, few and shallow pools, and excessive sedimentation of the streambed.

MINING CLAIM VALIDITY EXAMINATION: An examination of a mining claim by a mineral examiner to determine if the claim has a discovery or if all requirements for a millsite claim have been met. All claims for which a patent application has been filed must undergo such an exam.

MINING DISTRICT: An area, usually designated by name, with described or understood boundaries, where minerals are found and mined under rules prescribed by the miners, consistent with the Mining Law of 1872.

MINING LAW OF 1872 (GENERAL MINING LAW): The federal act that, with its amendments, formed the framework for the mining of locatable minerals on the public lands. This law declared that "valuable" mineral deposits rather than simply "mineral deposits" were to be free and open to exploration and purchase, limited individual claims to 20 acres, required $100 worth of assessment work yearly, and allowed milling or processing claims of 5 acres or less to be entered on nonmineral lands.

MINING LOCATION: A mining claim on the public lands.

MONOCULTURE: The growth of only a single plant species within an area.

MORAINE: An accumulation of boulders, stones, and other earth debris carried and deposited by a glacier.

MOST APPROPRIATE TECHNOLOGY AND PRACTICES: The use of technology and practices that have demonstrable feasibility, success, and practicality in meeting performance standards.

MUD: The mixture of water or oil and clay, and sometimes other special materials, used as a drill circulation liquid in drilling a borehole.

MULTIPLIER: The number of times new investment spending will be respent to produce a certain amount of new income.

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS): The allowable concentrations of air pollutants in the ambient (public outdoor) air specified in 40 CFR 50. National ambient air quality standards are based on the air quality criteria and divided into primary standards (allowing an adequate margin of safety to protect the public health) and secondary standards (allowing an adequate margin of safety to protect the public welfare). Welfare is defined as including (but not limited to) effects on soils, water, crops, vegetation, human-made materials, animals, wildlife, weather, visibility, climate, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being.

NATIONAL CONSERVATION AREA: A congressionally designated public land area that contains important resources and whose management objectives are (1) to conserve and protect these resources, (2) to maintain environmental quality, and (3) to provide for present and future users within a framework of multiple use and sustained yield.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA): The federal law, going into effect on January 1, 1970, that established a national policy for the environment and requires federal agencies (1) to become aware of the environmental ramifications of their proposed actions, (2) to fully disclose to the public proposed federal actions and provide a mechanism for public input to federal decisionmaking , and (3) to prepare environmental impact statements for every major action that would significantly affect the quality of the human environment.

NATIONAL HISTORIC PRESERVATION ACT (NHPA): A federal statute that established a federal program to further the efforts of private agencies and individuals in preserving the Nation's historic and cultural foundations. NHPA authorized the establishing of the National Register of Historic Places, established the Advisory Council on Historic Preservation and a National Trust Fund to administer grants for historic preservation, and authorized the development of regulations to require federal agencies to consider the effects of federally assisted activities on properties included on or eligible for the National Register of Historic Places.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES): A process for controlling the amount of pollution discharged into waters by requiring polluters to obtain NPDES permits from the states involved and to comply with discharge standards. The NPDES is mandated by the Federal Water Pollution Control Act Amendments.

NATIONAL PRIMARY DRINKING WATER STANDARDS (NPDWS): Developed by the Environmental Protection Agency to keep drinking water clean and protect the public from waterborne disease, these standards define either a maximum contaminant level or a treatment technique requirement to control the presence of contaminants in drinking water.

NATIONAL REGISTER OF HISTORIC PLACES: The official list, established by the National Historic Preservation Act of 1966, of the Nation's cultural resources worthy of preservation. The National Register lists archeological, historic, and architectural properties (districts, sites, buildings, structures, and objects) nominated for their local, state, or national significance by state and federal agencies and approved by the National Register Staff. The National Register is maintained by the National Park Service.

NATIONAL WILD AND SCENIC RIVERS SYSTEM: A system of nationally designated rivers and their immediate environments that have outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, and other similar values and are preserved in a free-flowing condition. The system consists of three types of streams: (1) recreation—rivers or sections of rivers that are readily accessible by road or railroad and that may have some development along their shorelines and may have undergone some impoundments or diversion in the past, (2) scenic—rivers or sections of rivers free of impoundments with shorelines or watersheds still largely undeveloped but accessible in places by roads, and (3) wild—rivers or sections of rivers free of impoundments and generally inaccessible except by trails with watersheds or shorelines essentially primitive and waters unpolluted.

NATIVE SPECIES: A species that is part of an area's original fauna or flora. See EXOTIC SPECIES.

NEOTROPICAL MIGRATORY BIRDS: Birds that travel to Central America, South America, the Caribbean, and Mexico during the fall to spend the winter and then return to the United States and Canada during the spring to breed. These birds include almost half of the bird species that breed in the United States and Canada.

NONFUNCTIONAL RIPARIAN-WETLAND AREAS: Areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate the stream energy of high flows and thus are not reducing erosion, improving water quality, and performing the other functions of an area in properly functioning condition.

NOTICE: The notification a mining operator must submit to BLM of the intention to begin an operation that will disturb 5 acres or less a year within a mining claim or project area. The intent of a Notice is to permit operations with limited geographic disturbance to begin after a quick review for potential resource conflicts and to eliminate the need for federal action. A Notice requires no special forms, but an operator must submit specific information. BLM must complete its review of the Notice within 15 calendar days of its receipt unless more information is required to determine if the operation would cause unnecessary or undue degradation.

NOTICE-LEVEL OPERATION: A mining or exploration operation involving more than casual use but requiring that the operator submit only a Notice rather than a Plan of Operations.

NOTICE OF NONCOMPLIANCE: An authorized officer's decision, sent to the mining operator and claimant, that (1) details provisions of the regulations that a mining operation has violated and (2) states corrective actions that the operation must take within a specified time. See RECORD OF NONCOMPLIANCE.

NOXIOUS WEED: According to the Federal Noxious Weed Act (PL 93-629), a weed that causes disease on has other adverse effects on humans and their environment and is therefore detrimental to public health and the agriculture and commerce of the United States.

NUTRIENT CYCLING: The circulation of chemical elements such as nitrogen, oxygen, carbon, and phosphorus in specific pathways from the abiotic (not involving or produced by organisms) portions of the environment into organic substances in plants and animals and then back into abiotic forms.

OBLIGATE: Essential, necessary, unable to exist in any other state, mode, or relationship.

OFF-ROAD VEHICLE (ORV) or OFF-HIGHWAY VEHICLE (OHV): Any vehicle capable of or designed for travel on or immediately over land, water, or other natural terrain, deriving motive power from any source other than muscle. ORVs excludes (1) any nonamphibious registered motorboat; (2) any fire, emergency, or law enforcement vehicle while being used for official or emergency purposes; and (3) any vehicle whose use is expressly authorized by a permit, lease, license, agreement, or contract issued by an authorized officer or otherwise approved.

OPEN PIT MINING: A surface mining method in which overlying rock and soil are removed to expose an ore body, which is then drilled, blasted, and hauled from the pit.

OPERATIONS: All functions, work, facilities, and activities on public lands in connection with prospecting, discovery, and assessment work, development, extraction, and processing of mineral deposits locatable under the mining laws; reclamation of disturbed areas; and all other reasonably incident uses, whether on a mining claim or not, including the building of roads, transmission lines, pipelines, and other means of access across public lands for support facilities.

ORE: A mineral deposit of high enough quality to be mined at a profit.

OREBODY: A mineralized mass whose characteristics have been determined and deemed commercially viable. The term orebody is used once the economic limits of the mineralized mass and its grade have been examined.

ORE RESERVES: The portion of a mineral deposit that can be profitably mined. Use of this term implies detailed knowledge of all the geological, engineering, economic, and environmental parameters that might affect the profitability of an operation. For a new mining project or for the mining of new zones in an existing mine, a formal feasibility study is conducted to evaluate all parameters of the project.

OROGRAPHIC EFFECT: The effect on the passing flow of air of mountains, which may cause the lifting or diverting of air, creation of clouds, and increases in leeward precipitation.

OVERBURDEN: All the earth and other materials that overlie a natural mineral deposit.

OVERBURDEN RATIO: In strip mining the ratio of the vertical thickness of overburden to the vertical thickness of the underlying ore.

OXIDE ORE: Ore containing minerals that have been altered by oxidation or the weathering process.

PALEONTOLOGICAL RESOURCES (FOSSILS): The physical remains of plants and animals preserved in soils and sedimentary rock formations. Paleontological resources are important for understanding past environments, environmental change, and the evolution of life.

PARENT MATERIAL (SOIL): The unconsolidated more or less chemically weathered mineral or organic matter from which the upper level of the soil profile has developed.

PARTICULATE MATTER: Fine liquid or solid particles suspended in the air and consisting of dust, smoke, mist, fumes, and compounds containing sulfur, nitrogen, and metals.

PASSERINE BIRDS: Birds of the order Passeriformes, which includes perching birds and songbirds such as blackbirds, jays, finches, warblers, and sparrows. More than half of all known birds belong to this order.

PATENT: The instrument by which the Federal Government conveys title to the public lands.

PAY STREAK: The areas of concentration of gold in placer deposits.

PAY LAYER: Ore, a mineral deposit of high enough quality to be mined at a profit.

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PERIPHYTON: Microscopic plants and animals that are firmly attached to such solid surfaces under water as rocks, logs, pilings, and other structures.

PERENNIAL STREAM: A stream that flows continuously during all seasons of the year.

PERENNIAL VEGETATION: Plants that have a life cycle of 3 or more years.
PERSONAL INCOME: The sum of wage and salary disbursements, other labor income, proprietors' income, rental income of persons, personal dividend income, personal interest income, and transfer payments to persons, less personal contributions for social insurance.

pH: A measure of acidity or hydrogen ion activity. Neutral is pH 7.0. All values below 7.0 are acidic, and all values above 7.0 are alkaline.

PHOTOSYNTHESIS: The manufacture by plants of carbohydrates and oxygen from carbon dioxide and water in the presence of chlorophyll, using sunlight as an energy source.

PHREATOPHYTE: A plant that absorbs its water from a permanent supply in the ground.

PHYLA: In taxonomy, the primary divisions of the plant and animal kingdoms.

PHYSIOGRAPHIC PROVINCE: A region defined by a unified geologic history and a characteristic geologic structure and climate that differs from adjoining regions.

PHYTOPLANKTON: Unattached microscopic plants of plankton, subject to movement by wave or current action. See PLANKTON.

PIT LAKE: Water body that forms at the bottom of an open pit mine when mining extends below the water table.

PLACER: An alluvial deposit of sand and gravel containing valuable minerals such as gold.

PLACER CLAIM: A mining claim located upon gravel or ground whose mineral contents are extracted by the use of water.

PLACER DEPOSIT: A mass of gravel, sand, or similar material resulting from the crumbling and erosion of solid rocks containing particles of gold or other valuable minerals that have been derived from rocks or veins.

PLAN: See PLAN OF OPERATIONS.

PLANKTON: Suspended, floating, or weakly swimming microscopic plants and animals in the water that provide a basis for the aquatic food chain. Plankton include bacteria, algae, protozoans, rotifers, larvae, and small crustaceans.

PLAN OF OPERATIONS: A plan for mining exploration and development that an operation must submit to BLM for approval when more than 5 acres a year will be disturbed or when an operator plans to work in an area of critical environmental concern or a wilderness area. A Plan of Operations must document in detail all actions that the operator plans to take from exploration through reclamation.

PLAYA: A dried-up, flat-floored area consisting of thin, evenly layered sheets of fine clay, silt, or sand, and representing the bottom of a shallow, undrained desert lake basin in which water accumulates and is quickly evaporated, usually leaving deposits of soluble salts.

PLEISTOCENE MEGAFAUNA: Large mammals that inhabited North America before the end of the last glaciation and that became extinct. Such animals include the mammoth, mastodon, camel, giant slot, Bison antiquus, and Bison occidentalis.

PLUME: A visible or measurable discharge of a contaminant from a given point of origin. A plume can be visible or thermal in water, or visible in the air.

POPULATION: Within a species, a distinct group of individuals that tend to mate only with members of the group. Because of generations of inbreeding, members of a population tend to have similar genetic characteristics.

PORE WATER PRESSURE (PORE PRESSURE): The stress transmitted through the fluid that fills the voids between particles of a soil or rock mass.

POROSITY: A rock, soil, or other material's property of containing interstices. Porosity is commonly expressed as a percentage of the bulk volume of a material occupied by interstices.

PRECIOUS METAL: A general term for gold, silver, or any of the minerals of the platinum group.

PREGNANT POND: A pond containing liquid that is charged with valuable minerals.

PREGNANT SOLUTION: A solution in hydrometalurigical treatment that is charged with valuable minerals and awaits their removal. See BARREN SOLUTION.

PREY BASE: Populations and types of prey species available to predators, for example fish species and populations available to river otters.

PRIMARY POLLUTANT: A pollutant emitted directly from a source. See SECONDARY POLLUTANT.

PRIMARY POROSITY: The porosity that developed during the final stages of sedimentation or was present within sedimentary particles at the time of deposition. See POROSITY and SECONDARY POROSITY.

PRIMARY PRODUCERS: Green plants that can manufacture food from simple organic substances.

PRIMARY PRODUCTION: The production of organic substances by photosynthesis; the amount of material so produced per unit time.

PROBABLE MAXIMUM PRECIPITATION: The precipitation that may be expected from the most severe combination of critical meteorologic conditions and that is reasonably possible in an area as found in the National Weather Service Hydrometeorological Reports.

PROJECT AREA: A single tract of land upon which a mining operator is or will be operating.

PROPER FUNCTIONING CONDITION (RIPARIAN-WETLAND AREAS): The condition where (1) enough vegetation, landform, or large woody debris is present to dissipate the stream energy of high water flows, thereby reducing erosion and improving water quality; (2) sediments are filtered, bedload is captured, and floodplains develop; (3) flood water retention and ground water recharge are improved, root masses that stabilize streambanks against cutting action develop, and diverse ponding and channel characteristics are created to provide the habitat and the water depth, duration, and temperature needed for fish production, waterfowl breeding, and other uses; and (4) greater biodiversity is supported. See FUNCTIONAL-AT-RISK.

PROPRIETARY INCOME: Payments received by the self-employed as income, including income received by private business owners, doctors, and lawyers.

PRUDENT OPERATOR: An operator who in good faith tries to develop a mineral operation, doing the best possible job, both economically and environmentally.

PUBLIC LANDS: Any land and interest in land owned by the United States and administered by the Secretary of the Interior through the Bureau of Land Management, without regard to how the United States acquired ownership, except for (1) land located on the Outer Continental Shelf and (2) land held for the benefit of Indians, Aleuts, and Eskimos.

PUBLIC RANGELANDS IMPROVEMENT ACT OF 1978: An act that sought to improve range conditions on the public lands. Among its provisions are a definition of the current grazing fee formula and the requirement that allotment management plans be developed "in careful and considered consultation, cooperation, and coordination" with the lessees, permittees, and landowners involved.

RAPTORS: Birds of prey.

RARE EARTH METALS: A group of widely distributed metals, consisting of the elements scandium, yttrium, and 15 elements of atomic numbers 57 to 71, inclusive. These metals have the same arrangement of the two external shells of electrons in their atoms and resemble one another closely in chemical and physical properties, being thus most difficult to separate from each other. It is to this property, rather than their actual rarity in nature, that they are so described.

REACTIVITY: A substance's tendency to undergo chemical reaction either by itself or with other materials with the release of energy. Undesirable effects such as pressure buildup, temperature increase, or formation of noxious, toxic, or corrosive byproducts may result from a substance's reactivity to heating, burning, direct contact with other materials, or other conditions.

RECHARGE AREA: An area that absorbs water that eventually reaches the zone of saturation in one or more aquifers.

RECORD OF NONCOMPLIANCE: Under the 43 CFR 3809 regulations, an administrative compliance procedure and document that BLM issues to an operator who has not resolved a notice of noncompliance. If an operator is issued a record of noncompliance, BLM can upgrade all of the operator's Notice-level operations to Plan-level operations and require the operations to be bonded at 100% of reclamation costs. See NOTICE OF NONCOMPLIANCE.

RECREATION OPPORTUNITY SPECTRUM (ROS): A planning process that provides a framework for defining classes of outdoor recreation environments, activities, and experience opportunities. In ROS the settings, activities, and opportunities for experiences are arranged along a continuum or spectrum of six classes: primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural, and urban. The resulting ROS analysis defines specific geographic areas on the ground, each of which encompasses one of the six classes.

REDD: The spawning ground or nest of various fishes.

REDUCERS (DECOMPOSERS): Organisms, usually bacteria or fungi, that break down complex organic material into simple compounds.

REFRACTORY-GRADE ORES: Ores that resist the action of chemical reagents in the normal treatment processes and generally require roasting or other means to fully recover valuable minerals.

RELICT: A remnant or fragment of the vegetation of an area that remains from a former period when the vegetation was more widely distributed.

REPLACEMENT GROWTH MEDIA: Material below the C horizon of the soil that can be substituted for topsoil or subsoil when it is equal or superior in quality as a surface cover for growing plants on reconstructed mine surfaces.

RESERVE BASE: The part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices. The reserve base includes resources that are currently economic and marginally economic and some that are currently subeconomic.

RESOURCE MANAGEMENT PLAN (RMP): A BLM planning document, prepared in accordance with Section 202 of the Federal Land Policy and Management Act, that presents systematic guidelines for making resource management decisions for a resource area. An RMP is based on an analysis of an areas's resources, their existing management, and their capability for alternative uses. RMPs are issue oriented and developed by an interdisciplinary team with public participation.

RIGHT-OF-WAY: A permit or easement that authorizes the use of lands for specified purposes, such as for a forest access road or a powerline.

RILL: A small, intermittent water course with steep sides, usually only a few inches deep.

RIPARIAN AREA: A form of wetland transition between permanently saturated wetlands and upland areas. Riparian areas exhibit vegetation or physical characteristics that reflect the influence of permanent surface or subsurface water. Typical riparian areas include lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels. Excluded are ephemeral streams or washes that lack vegetation and depend on free water in the soil.

ROASTING: Heating sulfide-bearing ores to release sulfur dioxide.

SALEABLE MINERALS: Common variety minerals on the public lands, such as sand and gravel, which are used mainly for construction and are disposed of by sales or special permits to local governments. See COMMON VARIETY MINERALS and UNCOMMON VARIETY MINERALS.

SCARIFY: To break the surface of the soil with a narrow bladed instrument.

SCOPING: An early and open process for determining the scope of issues to be addressed in an environmental impact statement and for identifying the significant issues related to a proposed action. Scoping may involve public meetings; field interviews with representatives of agencies and interest groups; discussions with resource specialists and managers; and written comments in response to news releases, direct mailings, and articles about the proposed action and scoping meetings.

SECONDARY POLLUTANT: A pollutant that is formed by a chemical or photochemical reaction in the atmosphere rather than emitted from an identifiable source. See PRIMARY POLLUTANT.

SECONDARY POROSITY: The porosity developed in a rock formation after its deposition or emplacement, either through the natural processes of dissolution or stress distortion, or artificially through acidization or the mechanical injection of coarse sand. See POROSITY and PRIMARY POROSITY.

SECTION 106 COMPLIANCE: The requirement of Section 106 of the National Historic Preservation Act that any project funded, licensed, permitted, or assisted by the Federal Government be reviewed for impacts to significant historic properties and that the State Historic Preservation Officer and the Advisory Council on Historic Preservation be allowed to comment on a project.

SECTION 7 CONSULTATION: The requirement of Section 7 of the Endangered Species Act that all federal agencies consult with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service if a proposed action might affect a federally listed species or its critical habitat.

SEDIMENTARY ROCKS: Rocks, such as sandstone, limestone, and shale, that are formed from sediments or from transported fragments deposited in water.

SEDIMENTATION: The process or action of depositing sediment.

SEDIMENT YIELD: The amount of sediment removed from a watershed over a specified period, usually expressed as tons, acre-feet, or cubic yards of sediment per unit of drainage area per year.

SEGREGATION: Any act such as a withdrawal or exchange that suspends the operation of the general public land laws. See WITHDRAWAL.

SENSITIVE LANDS: Any areas recognized in BLM land use or activity plans where BLM has determined that a Plan of Operations is required to provide detailed review of project effects on unique, irreplaceable, or outstanding historical, cultural, recreational, or natural resource values, such as threatened or endangered species or their critical habitat.

SENSITIVE SPECIES: All species that are under status review, have small or declining populations, live in unique habitats, or need special management. Sensitive species include threatened, endangered, and proposed species as classified by the Fish and Wildlife Service and National Marine Fisheries Service.

SERAL: Pertaining to the successional stages of biotic communities.

SHAFT: A vertical or inclined opening to an underground mine.

SHEAR STRENGTH: The maximum resistance of a soil to shearing stress.

SHORT SELLING: Selling a security that the seller does not own but is committed to repurchasing eventually. Short selling is used to capitalize on an expected decline in a security's price.

SHORT TON: 2,000 pounds.

SLOPE FAILURE: The downward and outward movement of rock or unconsolidated material as a unit or series of units.

SLOPE STABILITY: The resistance of any slope to failure by sliding or collapsing.

SLUICE BOX (SLUICE): A long, inclined trough or launder containing in its bottom riffles that provide a lodging place for heavy minerals in ore concentration. The material to be concentrated is carried down through the sluices on a current of water. Sluice boxes are widely used in placer operations for concentrating such minerals as gold and platinum from stream gravels.

SOIL HORIZON: A layer of soil or soil material roughly parallel to the land surface and differing from adjoining genetically related layers in physical, chemical, and biological properties or characteristics, such as color, structure, and texture.

SOIL PROFILE: A vertical section of the soil from the surface through all of its horizons.

SOIL REGIME: The layer of soil or growth media roughly parallel to the land surface upon which plants and their roots will penetrate and grow.

SOIL STRUCTURE: The physical constitution of soil material as expressed by size, shape, and the degree of development of primary soil particles and voids into naturally or artificially formed structural units.

SOIL TEXTURE: The relative proportions of the three size groups of soil grains (sand, silt, and clay) in a mass of soil.

SPAWNING GRAVELS: Stream-bottom gravels where fish deposit and fertilize their eggs. The covering of these gravels with silt can block the supply of oxygen to the eggs or serve as a cementing agent to prevent fry from emerging.

SPECIAL STATUS AREAS: Areas where under the proposed regulations (Alternative 3, the

Proposed Action and Preferred Alternative) BLM would require Plans of Operations for all operations exceeding casual use. Such areas consist of (1) lands in the California Desert Conservation Area (CDCA) designated by the CDCA Plan as "controlled" or "limited" use areas; (2) areas in the National Wild and Scenic Rivers System and designated for potential addition to the system; (3) areas of critical environmental concern (ACECs); (4) designated wilderness areas administered by BLM; (5) areas "closed" to off-road vehicle use; (6) areas identified in BLM land use or activity plans where BLM has determined that a Plan of Operations is required to provide detailed review of project effects on unique, irreplaceable, or outstanding historical, cultural, recreational, or natural resource values, such as threatened or endangered species or their critical habitat; (7) national monuments and national conservation areas administered by BLM; and (8) areas segregated in anticipation of a mineral withdrawal and all withdrawn areas, except for areas segregated or withdrawn under the Alaska Native Claims Settlement Act, the Alaska National Interest Lands Conservation Act, and the Alaska Statehood Act.

SPLIT-ESTATE: Land whose surface rights and mineral rights are owned by different entities. Such a condition commonly occurs when surface rights are owned by the Federal Government and the mineral rights are privately or state owned.

SPOIL: Overburden or waste excavated and redeposited in surface mining.

STOCK (FISH): A group of fish that is genetically self-sustaining and isolated geographically or temporally during reproduction. Generally, stock refers to a local population of fish. More specifically, stock refers to a local population, especially of salmon, steelhead, or other anadromous fish, that originates from specific watersheds as juveniles and generally returns to its birth streams to spawn as adults.

STOCK RAISING HOMESTEAD LANDS: Lands patented under the Stock Raising Homestead Act of December 29, 1916. These lands were not considered suitable for cultivation but were considered suitable for stock grazing. All minerals on these lands were retained by the United States.

STRATEGIC MINERALS: Minerals essential to the national defense for the supply of which during war we are wholly or partly dependent upon sources outside the continental limits of the United States, and for which strict measures are needed to control conservation and distribution. See CRITICAL MINERALS.

STRATIFICATION, LAKE: In a lake the presence of two or more horizontal layers of water of differing characteristics, such as density.

STREAM ORDER: A stream classification system based on the number of tributaries a stream has. The smallest unbranched tributary in a watershed is designated an Order 1 stream. A stream formed by the confluence of two Order 1 streams is designated an Order 2 stream. A stream formed by the confluence of two Order 2 streams is designated an Order 3 stream, and so on.

STRIP MINING: A form of surface mining in which relatively shallow overburden is stripped off the surface and the ore extracted. Usually designed for shallow, tabular deposits that are longer than they are wide, strip mines typically are located in areas of rugged topography where the deposit is interbedded between uneconomic rock units.

STRIPPING RATIO: In open pit mining, the ratio of the total waste removed to the total ore mined.

STRUCTURAL DIVERSITY (OF A STREAM CHANNEL): Within a stream channel the diversity of objects that control water movement.

STRUCTURE (STREAM CHANNEL): Any object, usually large, in a stream channel that controls water movement.

STUDY AREA: See EIS STUDY AREA.

SUBMERGENT VEGETATION: Aquatic plants that grow only within water and do not break the water's surface. See EMERGENT VEGETATION.

SUBSOIL: The B horizon of soils with distinct profiles, or the soil below the plowed soil (or its equivalent of surface soil) in soils with weak profile development.

SUBSTRATE: The mineral or organic material that forms the bed of a stream; the base upon which an organism lives.

SUCTION DREDGE: A dredge in which material is lifted by being pumped through a suction pipe.

SULFIDE ORE: Ore in which sulfide minerals predominate.

SUMMER RANGE: Range that is grazed mainly during the summer growing season. See WINTER RANGE.

SURFACE MINING CONTROL AND RECLAMATION ACT OF 1977 (SMCRA): A federal act that set rules for surface mining and reclamation of mined land, providing for transfer of much authority to states with approved programs.

SUSPENDED SEDIMENT: The very fine soil particles that are maintained in suspension in water for a considerable time by the upward components of turbulent currents or because they are fine enough to form a colloidal suspension.

TAILINGS: The waste matter from ore after the extraction of economically recoverable metals and minerals.

TAKE: As defined by the Endangered Species Act, "to harass, harm, pursue, hunt, shoot, wound, kill, capture, or collect, or attempt to engage in any such conduct."
TAXA: A group of organisms sharing common characteristics in varying degrees of distinction and constituting one of the categories in taxonomic classification, such as a phylum, order, family, genus, or species

TERRESTRIAL SPECIES: Ground-dwelling plants and animals.

THREATENED SPECIES: Any plant or animals species likely to become endangered within the foreseeable future throughout all or a part of its range and designated by the U.S. Fish and Wildlife Service under the Endangered Species Act. See ENDANGERED SPECIES.

TOTAL DISSOLVED SOLIDS (TDS): Salt—an aggregate of carbonates, bicarbonates, chlorides,

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sulfates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts. High TDS solutions can change the chemical nature of water, exert varying degrees of osmotic pressure, and often become lethal to aquatic life.

TOTAL SUSPENDED PARTICULATES (TSP): Particulate matter in the atmosphere that is generally less than 50 micrometers in diameter and that settles slowly and includes droplets, dust, fumes, pollen, sand, and soot.

TRACE METALS: Metals that are present in small concentrations.

TRADITIONAL CULTURAL PROPERTY (TCP): A cultural property that is eligible for inclusion in the National Register of Historic Places because of its association with a living community's cultural practices or beliefs that (a) are rooted in that community's history and (b) are important in maintaining the community's continuing cultural identity.

TRADITIONAL LIFEWAY VALUES: Values that are important for maintaining a specific group's traditional system of religious belief, cultural practice, or social interaction. A group's shared traditional lifeway values are abstract, nonmaterial, ascribed ideas that cannot be discovered except through discussions with members of the group. These values may or may not be closely associated with definite locations.

TRANSPIRATION: The photosynthetic and physiological process by which water in plants is transported as water vapor to the atmosphere.

TROPHIC LEVEL: The level in a nutritive series of an ecosystem in which a group of organisms in a certain stage in the food chain secures food in the same general manner. The first or lower trophic level consists of producers (green plants), the second level consists of herbivores, the third level consists of secondary carnivores, and the fourth level consists of reducers (decomposers).

TROY OUNCE: A unit of measure based on troy weight (12 ounces to a pound) and equal to 1.09714 avoirdupois ounces. (An avoirdupois ounce is the conventional U.S. weight measure in which 16 ounces equal 1 pound.)

TUNDRA: Treeless arctic and alpine areas where cover may consist of bare ground, grasses, sedges, forbs, dwarf shrubs, mosses, or lichens.

TUNNEL: A nearly horizontal underground passage open to the surface at both ends.

UNCOMMON VARIETY MINERALS: On the public lands stone, gravel, pumice, pumicite, and cinder deposits that have distinct and special properties making them commercially valuable for use in a manufacturing, industrial, or processing operation. Such minerals are locatable under the Mining Law of 1872, as amended. In determining a deposit's commercial value, the following factors may be considered: quality and quantity of the deposit, geographic location, accessibility to transportation, and proximity to market or point of use. See COMMON VARIETY MINERALS.

UNGULATES: Hoofed animals, including ruminants but also horses, tapirs, elephants, rhinoceroses, and swine.

UPLANDS: Lands at higher elevations than alluvial plains or low stream terraces; all lands outside the riparian-wetland and aquatic zones.

VALID EXISTING RIGHTS: Locatable mineral development rights that existed when the Federal Land Policy and Management Act (FLPMA) was enacted on October 21, 1976. Some areas are segregated from entry and location under the Mining Law to protect certain values or allow certain uses. Mining claims that existed as of the effective date of the segregation may still be valid if they can meet the test of discovery of a valuable mineral required under the Mining Law. Determining the validity of mining claims located in segregated lands requires BLM to conduct a validity examination and is called a "valid existing rights" determination.

VASCULAR: Having vessels for circulating or transmitting plant or animals fluids.

VEGETATIVE COMMUNITY: An assemblage of plant populations in a common spatial arrangement.

VEIN: A well-defined, typically tabular zone or belt of mineral-bearing rock confined between nonmineralized rock.

VESICLE: A cavity or variable space in lava formed by the entrapment of a gas bubble while the lava was solidifying.

VISION QUEST: A solitary vigil by an adolescent American Indian male to seek spiritual power and learn through a vision of a guardian spirit.

VISITOR DAY: 12 visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more people.

VISUAL RESOURCE MANAGEMENT (VRM): The planning, design, and implementing of management objectives to provide acceptable levels of visual impacts for all BLM resource management activities.

VISUAL RESOURCE MANAGEMENT (VRM) CLASS: The degree of visual change that is acceptable within the characteristic landscape. Based on the physical and sociological characteristics of any given homogeneous area, the VRM class serves as a management objective.

WARM-SEASON PLANTS: Plants whose major growth occurs during the spring, summer, or fall, and are usually dormant in winter. See COOL-SEASON PLANTS.

WASTE ROCK (WASTE): Barren rock at a mine or material that is too low in grade to be of economic value.

WATERSHED: The total area above a given point on a stream that contributes runoff water to the streamflow at that point.

WEATHERING: The disintegration and decomposition of rocks and other earth materials through exposure to the atmosphere. Weathering is one of the major factors in soil formation.

WETLANDS: Areas that are inundated or saturated by surface or ground water often and long enough to support and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions.

WETTED PERIMETER: The length of the wetted contact between a stream of flowing water and the stream bottom in a vertical plane at right angles to the direction of flow.

WILD AND SCENIC RIVER: See NATIONAL WILD AND SCENIC RIVERS SYSTEM.

WILDERNESS AREA: A congressionally designated area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, that is protected and managed to preserve its natural conditions and that (1) generally appears to have been affected mainly by the forces of nature, with human imprints substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres or is large enough to make practical its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

WILDERNESS STUDY AREA: On BLM-managed lands, a roadless area that has been inventoried (but not designated by Congress) and found to have wilderness characteristics as described in Section 603 of the Federal Land Policy and Management Act of 1976 and Section 2(c) of the Wilderness Act of 1964. BLM manages wilderness study areas to protect their wilderness characteristics until Congress decides whether to designate them as wilderness.

WILD HORSES AND BURROS (WILD FREE-ROAMING HORSES AND BURROS): All unbranded and unclaimed horses and burros using public lands as all or part of their habitat.

WINTER RANGE: Range that is grazed during winter. See SUMMER RANGE.

WITHDRAWAL: An action that restricts the use of public lands by removing them from the operation of some or all of the public land or mining laws. See SEGREGATION and MINERAL WITHDRAWAL.

ZONE OF SATURATION (PHREATIC ZONE): A subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere.

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Abbreviations

ACEC	area of critical environmental concern
AMD	acid mine drainage
ANILCA	Alaska National Interest Lands Conservation Act
APA	Administrative Procedures Act
ARD	acid rock drainage
ARPA	Archaeological Resources Protection Act
AUM	animal unit month
BAT	best available technology and practices
BEA	U.S. Department of Commerce, Bureau of Economic Analysis
BLM	U.S. Department of the Interior, Bureau of Land Management
CDCA	California Desert Conservation Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FLPMA	Federal Land Policy and Management Act
GAO	U.S. General Accounting Office
GDP	gross domestic product
GSP	gross state product
IBLA	Interior Board of Land Appeals
MSHA	Department of Labor, Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
ORV	off-road vehicle
PM^{10}	inhalable particulate matter
$\text{PM}^{2.5}$	fine particulate matter
PFC	properly functioning condition
PSD	prevention of significant deterioration
RCRA	Resource Conservation and Recovery Act
ROS	recreational opportunity spectrum
T&E	threatened and endangered
USBM	U.S. Department of the Interior, Bureau of Mines
USDI	U.S. Department of the Interior
USFS	U.S. Department of Agriculture, Forest Service
USGS	U.S. Geological Survey
VRM	visual resource management

APPENDIXES

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APPENDIX A
EXISTING 3809 REGULATIONS

PART 3800--MINING CLAIMS UNDER THE GENERAL MINING LAWS

Authority: 16 U.S.C. 351; 16 U.S.C. 460y-4; 30 U.S.C. 22; 31 U.S.C. 9701; 43 U.S.C. 154; 43 U.S.C. 299; 43 U.S.C. 1201; 43 U.S.C. 1740; 30 U.S.C. 28k.

* * * * *

Subpart 3809 -- Surface Management

Source: 45 FR 78909, Nov. 26, 1980, unless otherwise noted.

Note: The information collection requirements contained in this subpart have been approved by the Office of Management and Budget under 44 U.S.C. 3507 and assigned clearance number 1004 - 0104. This information is needed to permit the authorized officer to determine if a plan of operation is needed to protect the public lands and their resources and to determine if the plan of operations, if one is required, is adequate. The obligation to respond is required to obtain a benefit.

(See 48 FR 8816, Mar. 2, 1983.)

General

§ 3809.0 - 1 Purpose.

The purpose of this subpart is to establish procedures to prevent unnecessary or undue degradation of Federal lands which may result from operations authorized by the mining laws.

§ 3809.0 - 2 Objectives.

The objectives of this regulation are to:

(a) Provide for mineral entry, exploration, location, operations, and purchase pursuant to the mining laws in a manner that will not unduly hinder such activities but will assure that these activities are conducted in a manner that will prevent unnecessary or undue degradation and provide protection of nonmineral resources of the Federal lands;

(b) Provide for reclamation of disturbed areas; and

(c) Coordinate, to the greatest extent possible, with appropriate State agencies, procedures for prevention of unnecessary or undue degradation with respect to mineral operations.

§ 3809.0 - 3 Authority.

(a) Section 2319 of the Revised Statutes (30 U.S.C. 22 et seq.) provides that exploration, location and purchase of valuable mineral deposits, under the mining laws, on Federal lands shall be ``under regulations prescribed by law," and section 2478 of the Revised Statutes, as amended (43 U.S.C. 1201), provides that those regulations shall be issued by the Secretary.

(b) Sections 302, 303, 601, and 603 of the Federal and Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.) require the Secretary to take any action, by regulation or otherwise, to prevent unnecessary or undue degradation of the Federal lands, provide for enforcement of those regulations, and direct the Secretary to manage the California Desert Conservation Area under reasonable regulations which will protect the scenic, scientific, and environmental values against undue impairment, and to assure against pollution of streams and waters.

(c) The Act of July 23, 1955 (30 U.S.C. 612), provides that rights under mining claims located after July 23, 1955, shall prior to issuance of patent therefor, be subject to the right of the United States to manage and dispose of the vegetative surface resources and to manage other surface resources. The Act also provides that ``Any mining claim hereafter located under the mining laws of the United States shall not be used, prior to issuance to patent therefor, for any purposes other than prospecting, mining or processing operations and uses reasonably incident thereto."

(d) Section 9 of the Wild and Scenic Rivers Act (16 U.S.C. 1280) provides that regulations issued shall, among other things, provide safeguards against pollution of the rivers involved and unnecessary impairment of the scenery within the area designated for potential addition to, or an actual component of the national wild and scenic rivers system.

(e) The Act of October 21, 1970 (16 U.S.C. 460y et seq.), as amended by Section 602 of the Federal Land Policy and Management Act of 1976 (16 U.S.C. 460y - 8), established the King Range Conservation Area in California. The Secretary is required under these Acts to manage activities in this conservation area under the General Mining Law of 1872 in such a manner as to protect the scenic, scientific, and environmental values against undue impairment, and ensure against pollution of streams and waters.

[45 FR 78909, Nov, 26, 1980, as amended at 59 FR 44856, Aug. 30, 1994]

§ 3809.0 - 5 Definitions.

As used in this subpart, the term:

(a) Authorized officer means any employee of the Bureau of Land Management to whom authority has been delegated to perform the duties described in this subpart.

(b) Casual Use means activities ordinarily resulting in only negligible disturbance of the

Federal lands and resources. For example, activities are generally considered casual use if they do not involve the use of mechanized earth moving equipment or explosives or do not involve the use of motorized vehicles in areas designated as closed to off-road vehicles as defined in subpart 8340 of this title.

(c) Federal lands means lands subject to the mining laws including, but not limited to, the certain public lands defined in section 103 of the Federal Land Policy and Management Act of 1976. Federal lands does not include lands in the National Park System, National Forest System, and the National Wildlife Refuge System, nor does it include acquired lands, Stockraising Homestead lands or lands where only the mineral interest is reserved to the United States or lands under Wilderness Review and administered by the Bureau of Land Management (these lands are subject to the 43 CFR part 3802 regulations).

(d) Mining claim means any unpatented mining claim, millsite, or tunnel site located under the mining laws and those patented mining claims and millsites located in the California Desert Conservation Area which have been patented subsequent to the enactment of the Federal Land Policy and Management Act of October 21, 1976.

(e) Mining laws means the Lode Law of July 26, 1866, as amended (14 Stat. 251); the Placer Law of July 9, 1870, as amended (16 Stat. 217); and the Mining Law of May 10, 1872, as amended (17 Stat. 91); and all laws supplementing and amending those laws, including among others the Building Stone Act of August 4, 1892, as amended (27 Stat. 348); and the Saline Placer Act of January 31, 1901 (31 Stat. 745).

(f) Operations means all functions, work, facilities, and activities in connection with prospecting, discovery and assessment work, development, extraction, and processing of mineral deposits locatable under the mining laws and all other uses reasonably incident thereto, whether on a mining claim or not, including but not limited to the construction of roads, transmission lines, pipelines, and other means of access for support facilities across Federal lands subject to these regulations.

(g) Operator means a person conducting or proposing to conduct operations.

(h) Person means any citizen of the United States or person who has declared the intention to become such and includes any individual, partnership, corporation, association, or other legal entity.

(i) Project area means a single tract of land upon which an operator is, or will be, conducting operations. It may include one mining claim or a group of mining claims under one ownership on which operations are or will be conducted, as well as Federal lands on which an operator is exploring or prospecting prior to locating a mining claim.

(j) Reclamation means taking such reasonable measures as will prevent unnecessary or undue degradation of the Federal lands, including reshaping land disturbed by operations to an appropriate contour and, where necessary, revegetating disturbed areas so as to provide a diverse vegetative cover. Reclamation may not be required where the retention of a stable highwall or other mine workings is needed to preserve evidence of mineralization.

(k) Unnecessary or undue degradation means surface disturbance greater than what would normally result when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of similar character and taking into consideration the effects of operations on other resources and land uses, including those resources and uses outside the area of operations. Failure to initiate and complete reasonable mitigation measures, including reclamation of disturbed areas or creation of a nuisance may constitute unnecessary or undue degradation. Failure to comply with applicable environmental protection statutes and regulations thereunder will constitute unnecessary or undue degradation. Where specific statutory authority requires the attainment of a stated level of protection or reclamation, such as in the California Desert Conservation Area, Wild and Scenic Rivers, areas designated as part of the National Wilderness System administered by the Bureau of Land Management and other such areas, that level of protection shall be met.

(l) King Range Conservation Area means the area designated pursuant to the Act of October 21, 1970 (16 U.S.C. 460y et seq.), as amended by Section 602 of the Federal Land Policy and Management Act of 1976 (16 U.S.C. 460y - 8).

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980, as amended at 48 FR 8816, Mar. 2, 1983; 59 FR 44856, Aug. 30, 1994]

§ 3809.0 - 6 Policy.

Consistent with section 2 of the Mining and Mineral Policy Act of 1970 and section 102(a) (7), (8), and (12) of the Federal Land Policy and Management Act, it is the policy of the Department of the Interior to encourage the development of Federal mineral resources and reclamation of disturbed lands. Under the mining laws a person has a statutory right, consistent with Departmental regulations, to go upon the open (unappropriated and unreserved) Federal lands for the purpose of mineral prospecting, exploration, development, extraction and other uses reasonably incident thereto. This statutory right carries with it the responsibility to assure that operations include adequate and responsible measures to prevent unnecessary or undue degradation of the Federal lands and to provide for reasonable reclamation.

§ 3809.1 Operations.

§ 3809.1 - 1 Reclamation.

All operations, whether casual, under a notice, or by a plan of operations, shall be reclaimed as required in this title.

§ 3809.1 - 2 Casual use: Negligible disturbance.

No notification to or approval by the authorized officer is required for casual use operations. However, casual use operations are subject to monitoring by the authorized officer to ensure that unnecessary or undue degradation of Federal lands will not occur.

§ 3809.1 - 3 Notice: Disturbance of 5 acres or less.

(a) All operators on project areas whose operations, including access across Federal lands to the project area, cause a cumulative surface disturbance of 5 acres or less during any calendar year shall notify the authorized officer in the District office of the Bureau of Land Management having jurisdiction over the land in which the claim(s) or project area is located. Prior to conducting additional operations under a subsequent notice covering substantially the same ground, the operator shall have completed reclamation of operations which were conducted under any previous notice. Notification of such activities, by the operator, shall be made at least 15 calendar days before commencing operations under this subpart by a written notice or letter.

(b) Approval of a notice, by the authorized officer, is not required. Consultation with the authorized officer may be required under paragraph (c)(3) of this section when the construction of access routes are involved. Notices properly filed under this section constitute authorization under part 8340 of this title (Off-Road Vehicles).

(c) The notice or letter shall include:

(1) Name and mailing address of the mining claimant and operator, if other than the claimant. Any change of operator or in the mailing address of the mining claimant or operator shall be reported promptly to the authorized officer;

(2) When applicable, the name of the mining claim(s), and serial number(s) assigned to the mining claim(s) recorded pursuant to subpart 3833 of this title on which disturbance will likely take place as a result of the operations;

(3) A statement describing the activities proposed and their location in sufficient detail to locate the activities on the ground, and giving the approximate date when operations will start. The statement shall include a description and location of access routes to be constructed and the type of equipment to be used in their construction. Access routes shall be planned for only the minimum width needed for operations and shall follow natural contours, where practicable, to minimize cut and fill. When the construction of access routes involves slopes which require cuts on the inside edge in excess of 3 feet, the operator may be required to consult with the authorized officer concerning the most appropriate location of the access route prior to commencing operations;

(4) A statement that reclamation of all areas disturbed will be completed to the standard described in § 3809.1 - 3(d) of this title and that reasonable measures will be taken to prevent unnecessary or undue degradation of the Federal lands during operations.

(d) The following standards govern activities conducted under a notice:

(1) Access routes shall be planned for only the minimum width needed for operations and shall follow natural contours, where practicable to minimize cut and fill.

(2) All tailings, dumps, deleterious materials or substances, and other waste produced by the operations shall be disposed of so as to prevent unnecessary or undue degradation and in accordance with applicable Federal and State Laws.

(3) At the earliest feasible time, the operator shall reclaim the area disturbed, except to the extent necessary to preserve evidence of mineralization, by taking reasonable measures to prevent or control on-site and off-site damage of the Federal lands.

(4) Reclamation shall include, but shall not be limited to:

(i) Saving of topsoil for final application after reshaping of disturbed areas have been completed;

(ii) Measures to control erosion, landslides, and water runoff;

(iii) Measures to isolate, remove, or control toxic materials;

(iv) Reshaping the area disturbed, application of the topsoil, and revegetation of disturbed areas, where reasonably practicable; and

(v) Rehabilitation of fisheries and wildlife habitat.

(5) When reclamation of the disturbed area has been completed, except to the extent necessary to preserve evidence of mineralization, the authorized officer shall be notified so that an inspection of the area can be made.

(e) Operations conducted pursuant to this subpart are subject to monitoring by the authorized officer to ensure that operators are conducting operations in a manner which will not cause unnecessary or undue degradation.

(f) Failure of the operator to prevent undue or unnecessary degradation or to complete reclamation to the standards described in this subpart may cause the operator to be subject to a notice of noncompliance as described in § 3809.3 - 2 of this title.

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980, as amended at 48 FR 8816, Mar. 2, 1983]

§ 3809.1 - 4 Plan of operations: When required.

An approved plan of operations is required prior to commencing:

(a) Operations which exceed the disturbance level (5 acres) described in § 3809.1 - 3 of this title.

(b) Any operation, except casual use, in the following designated areas:

(1) Lands in the California Desert Conservation Area designated as controlled or limited use areas by the California Desert Conservation Area plan;

(2) Areas designated for potential addition to, or an actual component of the national wild and scenic rivers system,

(3) Designated Areas of Critical Environmental Concern;

(4) Areas designated as part of the National Wilderness Preservation System and administered by the Bureau of Land Management;

(5) Areas designated as closed to off-road vehicle use as defined in subpart 8340 of this title.

(6) The area designated as the King Range Conservation Area pursuant to 16 U.S.C. 460y et seq., as amended by section 602 of the Federal Land Policy and Management Act of 1976.

(c) Plans properly filed and approved under this section constitute authorization under part 8340 of this title (Off-Road Vehicles).

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980, as amended at 48 FR 8816, Mar. 2, 1983; 59 FR 44856, Aug. 30, 1994]

§ 3809.1 - 5 Filing and contents of plan of operations.

(a) A plan of operations must be filed in the District Office of the Bureau of Land Management having jurisdiction over the Federal lands in which the claim(s) or project area is located.

(b) No special form is required for filing a plan.

(c) The plan shall include:

(1) The name and mailing address of the operator (and claimant if not the operator). Any change of operator or change in the mailing address shall be promptly reported to the authorized officer;

(2) A map, preferably a topographic map, or sketch showing existing and/or proposed routes

of access, aircraft landing areas, or other means of access, and size of each area where surface disturbance will occur;

(3) When applicable, the name of the mining claim(s) and mining claim serial numbers assigned to the mining claim(s) recorded pursuant to subpart 3833 of this title.

(4) Information sufficient to describe or identify the type of operations proposed, how they will be conducted and the period during which the proposed activity will take place;

(5) Measures to be taken to prevent unnecessary or undue degradation and measures to reclaim disturbed areas resulting from the proposed operations, including the standards listed in § 3809.1 - 3(d) of this title. Where an operator advises the authorized officer that he/she does not have the necessary technical resources to develop such measures the authorized officer will assist the operator in developing such measures. If an operator submits reclamation measures, the authorized officer will ensure that the operator's plan is sufficient to prevent unnecessary or undue degradation. All reclamation measures developed by the operator, or by the authorized officer in conjunction with the operator, shall become a part of the plan of operations.

(6) Measures to be taken during extended periods of nonoperation to maintain the area in a safe and clean manner and to reclaim the land to avoid erosion and other adverse impacts. If not filed at the time of plan submittal, this information shall be filed with the authorized officer whenever the operator anticipates a period of nonoperation.

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980]

§ 3809.1 - 6 Plan approval.

(a) A proposed plan of operations shall be submitted to the authorized officer, who shall promptly acknowledge receipt thereof to the operator. The authorized officer shall, within 30 days of such receipt, analyze the proposal in the context of the requirement to prevent unnecessary or undue degradation and provide for reasonable reclamation, and shall notify the operator:

(1) That the plan is approved; or

(2) Of any changes in or additions to the plan necessary to meet the requirements of these regulations; or

(3) That the plan is being reviewed, but that a specified amount of time, not to exceed an additional 60 days, is necessary to complete the review, setting forth the circumstances which justify additional time for review. However, days during which the area of operations is inaccessible for inspection shall not be counted when computing the 60 day period; or

(4) That the plan cannot be approved until 30 days after a final environmental statement has

been prepared and filed with the Environmental Protection Agency; or

(5) That the plan cannot be approved until the authorized officer has complied with section 106 of the National Historic Preservation Act or section 7 of the Endangered Species Act.

(b) The authorized officer shall consult with the appropriate official of the bureau or agency having surface management responsibilities where such responsibility is not exercised by the Bureau of Land Management. Prior to plan approval the authorized officer shall obtain the concurrence of such appropriate official to the terms and conditions that may be needed to prevent unnecessary or undue degradation.

(c) The authorized officer shall undertake an appropriate level of cultural resource inventory of the area to be disturbed. The inventory shall be completed within the time allowed by these regulations for approval of the plan (30 days). The operator is not required to do the inventory but may hire an archaeologist approved by the Bureau of Land Management in order to complete the inventory more expeditiously. The responsibility for and cost of salvage of cultural resources discovered during the inventory shall be the Federal Government's. The responsibility of avoiding adverse impacts on those cultural resources discovered during the inventory shall be the operator's.

(d) Pending final approval of the plan, the authorized officer shall approve any operations that may be necessary for timely compliance with requirements of Federal and State laws, subject to any terms and conditions that may be needed to prevent unnecessary or undue degradation.

(e) In the event of a change of operators involving an approved plan of operations, the new operator shall satisfy the requirements of § 3809.1 - 9 of this title as it relates to bonding.

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980]

§ 3809.1 - 7 Modification of plan.

(a) At any time during operations under an approved plan, the operator on his/her own initiative may modify the plan or the authorized officer may request the operator to do so.

(b) A significant modification of an approved plan must be reviewed and approved by the authorized officer in the same manner as the initial plan.

(c)(1) If, when requested to do so by the authorized officer, the operator does not furnish a proposed modification within a reasonable time, usually 30 days, the authorized officer may recommend to the State Director that the operator be required to submit a proposed modification of the plan. The recommendation of the authorized officer shall be accompanied by a statement setting forth the facts and the reasons for the recommendations.

(2) In acting upon such recommendations the State Director shall determine, within 30 days,

whether:

(i) All reasonable measures were taken by the authorized officer at the time the plan was approved to ensure that the proposed operations would not cause unnecessary or undue degradation of the Federal land;

(ii) The disturbance from the operations of the plan as approved or from unforeseen circumstances is or may become of such significance that modification of the plan is essential in order to prevent unnecessary or undue degradation; and

(iii) The disturbance can be minimized using reasonable means.

(3) Once the matter has been sent to the State Director, an operator is not required to submit a proposed modification of an approved plan until a determination is made by the State Director. Where the State Director determines that a plan shall be modified, the operator shall timely submit a modified plan to the authorized officer for review and approval.

(4) Operations may continue in accordance with the approved plan until a modified plan is approved, unless the State Director determines that the operations are causing unnecessary or undue degradation to the land. The State Director shall advise the operator of those reasonable measures needed to avoid such degradation and the operator shall immediately take all necessary steps to implement those measures within a reasonable period established by the State Director.

§ 3809.1 - 8 Existing operations.

[following section was reinstated by court's May 1998 ruling]

(a) Persons conducting operations on the effective date of these regulations, who would be required to submit a notice under § 3809.1 - 3 or a plan of operations under § 3809.1 - 4 of this title may continue operations but shall, within:

(1) 30 days submit a notice with required information outlined in § 3809.1 - 3 of this title for operations where 5 acres or less will be disturbed during a calendar year; or

(2) 120 days submit a plan in those areas identified in § 3809.1 - 4 of this title. Upon a showing of good cause, the authorized officer may grant an extension of time, not to exceed an additional 180 days, to submit a plan.

(b) Operations may continue according to the submitted plan during its review. If the authorized officer determines that operations are causing unnecessary or undue degradation of the Federal lands involved, the authorized officer shall advise the operator of those reasonable measures needed to avoid such degradation, and the operator shall take all necessary steps to implement those measures within a reasonable time recommended by the authorized officer. During the period of an appeal, if any, operations may continue without change, subject to other applicable Federal and State laws.

(c) Upon approval of a plan by the authorized officer, operations shall be conducted in accordance with the approval plan.

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980]

§ 3809.1 - 9 Bonding requirements.
[following section was reinstated by court's May 1998 ruling]

(a) No bond shall be required for operations that constitute casual use (§ 3809.1 - 2) or that are conducted under a notice (§ 3809.1 - 3 of this title).

(b) Any operator who conducts operations under an approved plan of operations as described in § 3809.1 - 5 of this title may, at the discretion of the authorized officer, be required to furnish a bond in an amount specified by the authorized officer. The authorized officer may determine not to require a bond in circumstances where operations would cause only minimal disturbance to the land. In determining the amount of the bond, the authorized officer shall consider the estimated cost of reasonable stabilization and reclamation of areas disturbed. In lieu of the submission of a separate bond, the authorized officer may accept evidence of an existing bond pursuant to State law or regulations for the same area covered by the plan of operations, upon a determination that the coverage would be equivalent to that provided in this section.

(c) In lieu of a bond, the operator may deposit and maintain in a Federal depository account of the United States Treasury, as directed by the authorized officer, cash in an amount equal to the required dollar amount of the bond or negotiable securities of the United States having a market value at the time of deposit of not less than the required dollar amount of the bond.

(d) In place of the individual bond on each separate operation, a blanket bond covering statewide or nationwide operations may be furnished at the option of the operator, if the terms and conditions, as determined by the authorized officer, are sufficient to comply with these regulations.

(e) In the event that an approved plan is modified in accordance with § 3809.1 - 7 of this title, the authorized officer shall review the initial bond for adequacy and, if necessary, adjust the amount of the bond to conform to the plan as modified.

(f) When all or any portion of the reclamation has been completed in accordance with the approved plan, the operator may notify the authorized officer that such reclamation has occurred and that she/he seeks a reduction in bond or Bureau approval of the adequacy of the reclamation, or both. Upon any such notification, the authorized officer shall promptly inspect the reclaimed area with the operator. The authorized officer shall then notify the operator, in writing, whether the reclamation is acceptable. When the authorized officer has accepted as completed any portion of the reclamation, the authorized officer shall authorize that the bond be reduced proportionally to cover the remaining reclamation to be accomplished.

(g) When a mining claim is patented, the authorized officer shall release the operator from that portion of the performance bond which applies to operations within the boundaries of the patented land. The authorized officer shall release the operator from the remainder of the performance bond, including the portion covering approved means of access outside the boundaries of the mining claim, when the operator has completed acceptable reclamation. However, existing access to patented mining claims, if across Federal lands shall continue to be regulated under the approved plan. The provisions of this subsection do not apply to patents. issued on mining claims within the boundaries of the California Desert Conservation Area (see § 3809.6 of this title).

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980]

§ 3809.2 Prevention of unnecessary or undue degradation.

§ 3809.2 - 1 Environmental assessment.

(a) When an operator files a plan of operations or a significant modification which encompasses land not previously covered by an approved plan, the authorized officer shall make an environmental assessment or a supplement thereto to identify the impacts of the proposed operations on the lands and to determine whether an environmental impact statement is required.

(b) In conjunction with the operator, the authorized officer shall use the environmental assessment to determine the adequacy of mitigating measures and reclamation procedures included in the plan to insure the prevention of unnecessary or undue degradation of the land. If an operator advises the authorized officer that he/she is unable to prepare mitigating measures, the authorized officer, in conjunction with the operator, shall use the environmental assessment as a basis for assisting the operator in developing such measures.

(c) If, as a result of the environmental assessment, the authorized officer determines that there is substantial public interest in the plan, the authorized officer shall notify the operator, in writing, that an additional period of time, not to exceed the additional 60 days provided for approval of a plan in § 3809.1 - 6 of this title, is required to consider public comments on the environmental assessment.

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980, as amended at 48 FR 8816, Mar. 2, 1983]

§ 3809.2 - 2 Other requirements for environmental protection.

All operations, including casual use and operations under either a notice (§ 3809.1 - 3) or a plan of operations (§ 3809.1 - 4 of this title), shall be conducted to prevent unnecessary or undue degradation of the Federal lands and shall comply with all pertinent Federal and State laws, including but not limited to the following:

(a) Air quality. All operators shall comply with applicable Federal and State air quality standards, including the Clean Air Act (42 U.S.C. 1857 et seq.).

(b) Water quality. All operators shall comply with applicable Federal and State water quality standards, including the Federal Water Pollution Control Act, as amended (30 U.S.C. 1151 et seq.).

(c) Solid wastes. All operators shall comply with applicable Federal and State standards for the disposal and treatment of solid wastes, including regulations issued pursuant to the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.). All garbage, refuse or waste shall either be removed from the affected lands or disposed of or treated to minimize, so far as is practicable, its impact on the lands.

(d) Fisheries, wildlife and plant habitat. The operator shall take such action as may be needed to prevent adverse impacts to threatened or endangered species, and their habitat which may be affected by operations.

(e) Cultural and paleontological resources. (1) Operators shall not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains or any historical or archaeological site, structure, building or object on Federal lands.

(2) Operators shall immediately bring to the attention of the authorized officer any cultural and/or paleontological resources that might be altered or destroyed on Federal lands by his/her operations, and shall leave such discovery intact until told to proceed by the authorized officer. The authorized officer shall evaluate the discoveries brought to his/her attention, take action to protect or remove the resource, and allow operations to proceed within 10 working days after notification to the authorized officer of such discovery.

(3) The Federal Government shall have the responsibility and bear the cost of investigations and salvage of cultural and paleontology values discovered after a plan of operations has been approved, or where a plan is not involved.

(f) Protection of survey monuments. To the extent practicable, all operators shall protect all survey monuments, witness corners, reference monuments, bearing trees and line trees against unnecessary or undue destruction, obliteration or damage. If, in the course of operations, any monuments, corners, or accessories are destroyed, obliterated or damaged by such operations, the operator shall immediately report the matter to the authorized officer. The authorized officer shall prescribe, in writing, the requirements for the restoration or reestablishment of monuments, corners, bearing and line trees.

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980, as amended at 48 FR 8816, Mar. 2, 1983]

§ 3809.3 General provisions.

§ 3809.3 - 1 Applicability of State law.

(a) Nothing in this subpart shall be construed to effect a preemption of State laws and regulations relating to the conduct of operations or reclamation on Federal lands under the mining laws.
[[following section was reinstated by court's May 1998 ruling]

(b) After the publication date of these regulations the Director, Bureau of Land Management, shall conduct a review of State laws and regulations in effect or due to come into effect, relating to unnecessary or undue degradation of lands disturbed by exploration for, or mining of, minerals locatable under the mining laws.

(c) The Director may consult with appropriate representatives of each State to formulate and enter into agreements to provide for a joint Federal-State program for administration and enforcement. The purpose of such agreements is to prevent unnecessary or undue degradation of the Federal lands from operations which are conducted under the mining laws, to prevent unnecessary administrative delay and to avoid duplication of administration and enforcement of laws. Such agreements may, whenever possible, provide for State administration and enforcement of such programs.

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980]

§ 3809.3 - 2 Noncompliance.

(a) Failure of an operator to file a notice under § 3809.1 - 3 of this title or a plan of operations under § 3809.1 - 4 of this title will subject the operator, at the discretion of the authorized officer, to being served a notice of non-compliance or enjoined from the continuation of such operations by a court order until such time as a notice or plan is filed with the authorized officer. The operator shall also be responsible to reclaim operations conducted without an approved plan of operations or prior to the filing of a required notice.

(b) Failure to reclaim areas disturbed by operations under § 3809.1 - 3 of this title is a violation of these regulations.

(1) Where an operator is conducting operations covered by 3809.1 - 3 (notice) of this title and fails to comply with the provisions of that section or properly conduct reclamation according to standards set forth in 3809.1 - 3(d) of this title, a notice of noncompliance shall be served by delivery in person to the operator or his/her authorized agent, or by certified mail addressed to his/her address of record.

(2) Operators conducting operations under an approved plan of operations who fails to follow the approved plan of operations may be subject to a notice of noncompliance. A notice of noncompliance shall be served in the same manner as described in § 3809.3 - 2(b)(1) of this

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section.

(c) All operators who conduct operations under a notice pursuant to § 3809.1 - 3 and a plan pursuant to § 3809.1 - 4 of this title on Federal lands without taking the actions specified in a notice of noncompliance within the time specified therein may be enjoined by an appropriate court order from continuing such operations and be liable for damages for such unlawful acts.

(d) A notice of noncompliance shall specify in what respects the operator is failing or has failed to comply with the requirements of applicable regulations, and shall specify the actions which are in violation of the regulations and the actions which shall be taken to correct the noncompliance and the time, not to exceed 30 days, within which corrective action shall be started.

[following section was reinstated by court's May 1998 ruling]

(e) Failure of an operator to take necessary actions on a notice of noncompliance, may constitute justification for requiring the submission of a plan of operations under § 3809.1 - 5 of this title, and mandatory bonding for subsequent operations which would otherwise be conducted pursuant to a notice under § 3809.1 - 3 of this title.

[45 FR 78909, Nov. 26, 1980; 45 FR 82934, Dec. 17, 1980]

§ 3809.3 - 3 Access.

(a) An operator is entitled to access to his operations consistent with provisions of the mining laws.

(b) Where a notice or a plan of operations is required, it shall specify the location of access routes for operations and other conditions necessary to prevent unnecessary or undue degradation. The authorized officer may require the operator to use existing roads to minimize the number of access routes, and, if practicable, to construct access roads within a designated transportation or utility corridor. When commercial hauling is involved and the use of an existing road is required, the authorized officer may require the operator to make appropriate arrangements for use and maintenance.

§ 3809.3 - 4 Fire prevention and control.

The operator shall comply with all applicable Federal and State fire laws and regulations, and shall take all reasonable measures to prevent and suppress fires in the area of operations.

§ 3809.3 - 5 Maintenance and public safety.

During all operations, the operator shall maintain his structures, equipment, and other facilities in a safe and orderly manner. Hazardous sites or conditions resulting from operations shall be marked by signs, fenced, or otherwise identified to alert the public in accordance with applicable Federal and State laws and regulations.

§ 3809.3 - 6 Inspection.

The authorized officer may periodically inspect operations to determine if the operator is complying with these regulations. The operator shall permit the authorized officer access for this purpose.

§ 3809.3 - 7 Periods of non-operation.

All operators shall maintain the site, structures and other facilities of the operations in a safe and clean condition during any non-operating periods. All operators may be required, after an extended period of non-operation for other than seasonal operations, to remove all structures, equipment and other facilities and reclaim the site of operations, unless he/she receives permission, in writing, from the authorized officer to do otherwise.

§ 3809.4 Appeals.

(a) Any operator adversely affected by a decision of the authorized officer made pursuant to the provisions of this subpart shall have a right of appeal to the State Director, and thereafter to the Board of Land Appeals, Office of Hearings and Appeals, pursuant to part 4 of this title, if the State Director's decision is adverse to the appellant.

(b) No appeal shall be considered unless it is filed, in writing, in the office of the authorized officer who made the decision from which an appeal is being taken, within 30 days after the date of receipt of the decision. A decision of the authorized officer from which an appeal is taken to the State Director shall be effective during the pendency of an appeal. A request for a stay may accompany the appeal.

(c) The appeal to the State Director shall contain:

(1) The name and mailing address of the appellant.

(2) When applicable, the name of the mining claim(s) and serial number(s) assigned to the mining claims recorded pursuant to subpart 3833 of this title which are subject to the appeal.

(3) A statement of the reasons for the appeal and any arguments the appellant wishes to present which would justify reversal or modification of the decision.

(d) The State Director shall promptly render a decision on the appeal. The decision shall be in writing and shall set forth the reasons for the decision. The decision shall be sent to the appellant by certified mail, return receipt requested.

(e) The decision of the State Director, when adverse to the appellant, may be appealed to the

Board of Land Appeals, Office of Hearings and Appeals, pursuant to part 4 of this title.

(f) Any party, other than the operator, aggrieved by a decision of the authorized officer shall utilize the appeals procedures in part 4 of this title. The filing of such an appeal shall not stop the authorized officer's decision from being effective.

(g) Neither the decision of the authorized officer nor the State Director shall be construed as final agency action for the purpose of judicial review of that decision.

[45 FR 78909, Nov. 26, 1980, as amended at 48 FR 8816, Mar. 2, 1983]

§ 3809.5 Public availability of information.

(a) Information and data submitted and specifically identified by the operator as containing trade secrets or confidential or privileged commercial or financial information shall not be available for public examination. Other information and data submitted by the operator shall be available for examination by the public at the office of the authorized officer in accordance with the provisions of the Freedom of Information Act.

(b) The determination concerning specific information which may be withheld from public examination shall be made in accordance with the rules in 43 CFR part 2.

§ 3809.6 Special provisions relating to mining claims patented within the boundaries of the California Desert Conservation Area.

In accordance with section 601(f) of the Federal Land Policy and Management Act of October 21, 1976, all patents issued on mining claims located within the boundaries of the California Desert Conservation Area after the enactment of the Federal Land Policy and Management Act shall be subject to the regulations in this part, including the continuation of a plan of operations and of bonding with respect to the land covered by the patent.

APPENDIX B
PROPOSED 3809 REGULATIONS

PART 3800--MINING CLAIMS UNDER THE GENERAL MINING LAWS

1. BLM is amending part 3800 by revising subpart 3809 to read as follows:

Subpart 3809--Surface Management

Sec.

GENERAL INFORMATION

3809.1 What are the purposes of this subpart?
3809.2 What is the scope of this subpart?
3809.3 What rules must I follow if State law conflicts with this subpart?
3809.5 How does BLM define certain terms used in this subpart?
3809.10 How does BLM classify operations?
3809.11 When does BLM require that I submit a notice or a plan of operations?
3809.11 When does BLM require that I submit a notice of intention to operate or a plan of operations? (Forest Service Alternative)
3809.100 What special provisions apply to operations on segregated or withdrawn lands?
3809.101 What special provisions apply to minerals that may be common variety minerals, such as sand, gravel, and building stone?
3809.111 Public availability of information.
3809.115 Information collection.
3809.116 As a mining claimant or operator, what are my responsibilities under this subpart for my project area?

FEDERAL/STATE AGREEMENTS

3809.201 What kinds of agreements may BLM and a State make under this subpart?
3809.202 Under what conditions will BLM defer to State regulation of operations?
3809.203 What are the limitations on BLM deferral to State regulation of operations?
3809.204 Does this subpart cancel an existing agreement between BLM and a State?

OPERATIONS CONDUCTED UNDER NOTICES

3809.300 Does this subpart apply to my existing notice-level operations?
3809.301 Where do I file my notice and what information must I include in it?
3809.311 What action does BLM take when it receives my notice?
3809.312 When may I begin operations after filing a complete notice?
3809.313 Under what circumstances may I not begin operations 15 business days after filing my notice?

3809.320 Which performance standards apply to my notice-level operations?
3809.330 May I modify my notice?
3809.331 Under what conditions must I modify my notice?
3809.332 How long does my notice remain in effect?
3809.333 May I extend my notice, and, if so, how?
3809.334 What if I temporarily stop conducting operations under a notice?
3809.335 What happens when my notice expires?
3809.336 What if I abandon my notice-level operations?

OPERATIONS CONDUCTED UNDER PLANS OF OPERATIONS

3809.400 Does this subpart apply to my existing or pending plan of operations?
3809.401 Where do I file my plan of operations and what information must I include with it?
3809.411 What action will BLM take when it receives my plan of operations?
3809.412 When may I operate under a plan of operations?
3809.415 How do I prevent unnecessary or undue degradation while conducting operations on public lands?
3809.420 What performance standards apply to my notice or plan of operations?
3809.423 How long does my plan of operations remain in effect?
3809.424 What are my obligations if I stop conducting operations?

MODIFICATIONS OF PLANS OF OPERATIONS

3809.430 May I modify my plan of operations?
3809.431 When must I modify my plan of operations?
3809.432 What process will BLM follow in reviewing a modification of my plan of operations?
3809.433 Does this subpart apply to a new modification of my plan of operations?
3809.434 Does this subpart apply to my pending modification for a new facility?
3809.435 Does this subpart apply to my pending modification for an existing facility?

FINANCIAL GUARANTEE REQUIREMENTS--GENERAL

3809.500 In general, what are BLM's financial guarantee requirements?
3809.503 When must I provide a financial guarantee for my notice-level operations?
3809.505 How do the financial guarantee requirements of this subpart apply to my existing plan of operations?
3809.551 What are my choices for providing BLM with a financial guarantee?

INDIVIDUAL FINANCIAL GUARANTEE

3809.552 What must my individual financial guarantee cover?
3809.553 May I post a financial guarantee for a part of my operations?
3809.554 How do I estimate the cost to reclaim my operations?
3809.555 What forms of individual financial guarantee are acceptable to BLM?
3809.556 What special requirements apply to financial guarantees described in §3809.555(e)?

BLANKET FINANCIAL GUARANTEE

3809.560 **Under what circumstances may I provide a blanket financial guarantee?**

STATE-APPROVED FINANCIAL GUARANTEE

3809.570 **Under what circumstances may I provide a State-approved financial guarantee?**
3809.571 **What forms of State-approved financial guarantee are acceptable to BLM?**
3809.572 **What happens if BLM rejects a financial instrument in my State-approved financial guarantee?**
3809.573 **What happens if the State makes a demand against my financial guarantee?**

MODIFICATION OR REPLACEMENT OF A FINANCIAL GUARANTEE

3809.580 **What happens if I modify my notice or approved plan of operations?**
3809.581 **Will BLM accept a replacement financial instrument?**
3809.582 **How long must I maintain my financial guarantee?**

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3809.590 **When will BLM release or reduce the financial guarantee for my notice or plan of operations?**
3809.591 **What are the limitations on the amount by which BLM may reduce my financial guarantee?**
3809.592 **Does release of my financial guarantee relieve me of all responsibility for my project area?**
3809.593 **What happens to my financial guarantee if I transfer my operations?**
3809.594 **What happens to my financial guarantee when my mining claim is patented?**

FORFEITURE OF FINANCIAL GUARANTEE

3809.595 **When will BLM initiate forfeiture of my financial guarantee?**
3809.596 **How does BLM initiate forfeiture of my financial guarantee?**
3809.597 **What if I do not comply with BLM's forfeiture notice?**
3809.598 **What if the amount forfeited will not cover the cost of reclamation?**
3809.599 **What if the amount forfeited exceeds the cost of reclamation?**

INSPECTION AND ENFORCEMENT

3809.600 **With what frequency will BLM inspect my operations?**
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PENALTIES

3809.700 **What criminal penalties apply to violations of this subpart?**

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APPEALS

3809.800	**What appeal rights do I have?**

Subpart 3809--Surface Management

AUTHORITY: 16 U.S.C. 1280; 30 U.S.C. 22; 30 U.S.C. 612; 43 U.S.C. 1201; and 43 U.S.C. 1732, 1733, 1740, 1781, and 1782.

GENERAL INFORMATION

§3809.1 What are the purposes of this subpart?

The purposes of this subpart are to:

(a) Prevent unnecessary or undue degradation of public lands by operations authorized by the mining laws. Anyone intending to develop mineral resources on the public lands must prevent unnecessary or undue degradation of the land and reclaim disturbed areas. This subpart establishes procedures and standards to ensure that operators and mining claimants meet this responsibility; and

(b) Provide for maximum possible coordination with appropriate State agencies to avoid duplication and to ensure that operators prevent unnecessary or undue degradation of public lands.

§3809.2 What is the scope of this subpart?

(a) This subpart applies to all operations authorized by the mining laws on public lands, including Stock Raising Homestead lands, as provided in §3809.11(i), where the mineral interest is reserved to the United States.

(b) This subpart does not apply to lands in the National Park System, National Forest System, and the National Wildlife Refuge System; acquired lands; lands leased or patented under the Recreation and Public Purposes Act; lands patented under the Small Tract Act; or lands administered by BLM that are under wilderness review, which are subject to subpart 3802 of this part.

(c) This subpart applies to all patents issued after October 21, 1976 for mining claims in the California Desert Conservation Area, except for any patent for which a right to the patent vested before that date.

(d) This subpart applies to operations that involve metallic minerals; some industrial minerals, such as gypsum; and a number of other non-metallic minerals that have a unique property which gives the deposit a distinct and special value. This subpart does not apply to leasable and salable minerals. Leasable minerals, such as coal, phosphate, sodium, and potassium; and salable minerals, such as common varieties of sand, gravel, stone, and pumice, are not subject to location under the mining laws. Parts 3400, 3500 and 3600 of this title govern mining operations for leasable and salable minerals.

§3809.3 What rules must I follow if State law conflicts with this subpart?

If State laws or regulations conflict with this subpart regarding operations on public lands, you must follow the requirements of this subpart. However, there is no conflict if the State law or regulation requires a higher standard of protection for public lands than this subpart.

§3809.5 How does BLM define certain terms used in this subpart?

As used in this subpart, the term:

Casual use means activities ordinarily resulting in no or negligible disturbance of the public lands or resources. For example--

(1) Casual use generally includes the collection of mineral specimens using hand tools, hand panning, and non-motorized sluicing.

(2) Casual use does not include use of mechanized earth-moving equipment, truck-mounted drilling equipment, portable suction dredges, motorized vehicles in areas designated as closed to "off-road vehicles" as defined in §8340.0-5 of this title, chemicals, or explosives; "occupancy" as defined in §3715.0-5 of this title; or hobby or recreational mining in areas where the cumulative effects of the activities result in more than negligible disturbance.

Mining claim means any unpatented mining claim, millsite, or tunnel site located under the mining laws. The term also applies to those mining claims and millsites located in the California Desert Conservation Area that were patented after the enactment of the Federal Land Policy and Management Act of October 21, 1976. Mining "claimant" is defined in §3833.0-5 of this title.

Mining laws means the Lode Law of July 26, 1866, as amended (14 Stat. 251); the Placer Law of July 9, 1870, as amended (16 Stat. 217); and the Mining Law of May 10, 1872, as amended (17 Stat. 91); as well as all laws supplementing and amending those laws, including the Building Stone Act of August 4, 1892, as amended (27 Stat. 348); the Saline Placer Act of January 31, 1901 (31 Stat. 745); the Surface Resources Act of 1955 (30 U.S.C. 611-614); and the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.).

Minimize means to reduce the adverse impact of an operation to the lowest practical level. During review of operations, BLM may determine that "minimize"means to avoid or eliminate particular impacts.

Mitigation, as defined in 40 CFR 1508.20, may include one or more of the following:

(1) Avoiding the impact altogether by not taking a certain action or parts of an action;

(2) Minimizing impacts by limiting the degree or magnitude of the action and its implementation;

(3) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

(4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and

(5) Compensating for the impact by replacing, or providing substitute, resources or environments.

Most appropriate technology and practices (MATP) means equipment, devices, or methods that have demonstrable feasibility, success, and practicality in meeting the standards of this subpart. MATP includes the use of equipment and procedures that are either proven or reasonably expected to be effective in a particular region or location. MATP does not necessarily require use of the most expensive technology or practice. BLM determines whether the requirement to use MATP is met on a case-by-case basis during its review of a notice or plan of operations.

Operations means all functions, work, facilities, and activities on public lands in connection with prospecting, discovery and assessment work, development, extraction, and processing of mineral deposits locatable under the mining laws; reclamation of disturbed areas; and all other reasonably incident uses, whether on a mining claim or not, including the construction of roads, transmission lines, pipelines, and other means of access across public lands for support facilities.

Operator means any person who manages, directs, or conducts operations at a project area under this subpart, including a parent entity or an affiliate who materially participates in such management, direction, or conduct. An operator on a particular mining claim may also be the mining claimant.

Person means any individual, firm, corporation, association, partnership, trust, consortium, joint venture, or any other entity conducting operations on public lands.

Project area means the area of land upon which the operator conducts operations, including the area required for construction or maintenance of roads, transmission lines, pipelines, or other means of access by the operator.

Public lands, as defined in 43 U.S.C. 1702, means any land and interest in land owned by the

United States within the several States and administered by the Secretary of the Interior through the BLM, without regard to how the United States acquired ownership, except--

(1) Lands located on the Outer Continental Shelf; and

(2) Lands held for the benefit of Indians, Aleuts, and Eskimos.

Reclamation means taking measures required by this subpart following disturbance of public lands caused by operations to meet applicable performance standards and achieve conditions required by BLM at the conclusion of operations. Components of reclamation include, where applicable:

(1) Isolation, control, or removal of acid-forming, toxic, or deleterious substances;

(2) Regrading and reshaping to conform with adjacent landforms, facilitate revegetation, control drainage, and minimize erosion;

(3) Rehabilitation of fisheries or wildlife habitat;

(4) Placement of growth medium and establishment of self-sustaining revegetation;

(5) Removal or stabilization of buildings, structures, or other support facilities;

(6) Plugging of drill holes and closure of underground workings; and

(7) Providing for post-mining monitoring, maintenance, or treatment.

For a definition of "reclamation" applicable to operations conducted under the mining laws on Stock Raising Homestead Act lands, see part 3810, subpart 3814 of this title.

Riparian area is a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Typical riparian areas include lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels. Excluded are areas such as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

Tribe means, and Tribal refers to, a Federally recognized Indian tribe.

Unnecessary or undue degradation means conditions, activities, or practices that:

(1) Fail to comply with one or more of the following: §3809.420 of this subpart, the terms and conditions of an approved plan of operations, operations described in a complete notice, and

other Federal and State laws related to environmental protection and protection of cultural resources;

(2) Are not "reasonably incident" to prospecting, mining, or processing operations as defined in §3715.0-5 of this title; or

(3) Fail to attain a stated level of protection or reclamation required by specific laws in areas such as the California Desert Conservation Area, Wild and Scenic Rivers, BLM-administered portions of the National Wilderness System, and BLM-administered National Monuments and National Conservation Areas.

§3809.10 How does BLM classify operations?

BLM classifies operations as--

(a) Casual use, for which an operator generally need not notify BLM;

(b) Notice-level operations, for which an operator must submit a notice (except for certain suction-dredging operations covered by §3809.11(h)); and

(c) Plan-level operations, for which an operator must submit a plan of operations and obtain BLM's approval.

§3809.11 When does BLM require that I submit a notice or a plan of operations?

To see when you must submit a notice or a plan of operations, follow this table:

If your operations . . .	**Then . . .**
(a) Consist of casual use,	You do not need to notify BLM or seek permission to conduct operations. You must reclaim casual-use disturbance. BLM may monitor your operations to ensure that unnecessary or undue degradation does not occur.
(b) Consist of unreclaimed surface disturbance of 5 acres or less of public lands,	You must give BLM a complete notice of your planned activities 15 business days before you plan to start operations. You have the option to file a plan of operations. You must not segment a project area by filing a series of notices solely to avoid filing a plan of operations. See §§3809.300 to 3809.336.

If your operations . . .	**Then . . .**
(c) Consist of unreclaimed surface disturbance of more than 5 acres of public lands,	You must submit a plan of operations and obtain BLM's approval before beginning operations. See §§3809.400 to 3809.435.
(d) Cause any surface disturbance greater than casual use in the special status areas described in paragraph (j) of this section,	You must submit a plan of operations and obtain BLM's approval. See §§3809.400 to 3809.435.
(e) Involve any recreational mining activities by a group, such as a mining club,	The group's representative must contact BLM at least 15 business days before initiating activities to find out if BLM will require the group to file a notice or a plan of operations. This contact is not required if the group submits a notice or plan of operations.
(f) Involve any leaching or storage, addition, or use of chemicals in milling, processing, beneficiation, or concentrating activities (This does not include chemicals used solely for fuel or as lubricants for equipment.),	You must submit a plan of operations and obtain BLM's approval. See §§3809.400 to 3809.435.
(g) Require you to occupy or use a site for activities "reasonably incident" to mining, as defined in § 3715.0-5 of this title,	Whether you are operating under a notice or a plan, you must also comply with part 3710, subpart 3715, of this title.
(h) Involve the use of a portable suction dredge with an intake diameter of 4 inches or less, the State requires an authorization for its use, and BLM and the State have an agreement under §3809.201 addressing suction dredging,	You need not submit a notice or plan of operations unless otherwise required by this section. For all other use of a suction dredge, you must submit to BLM either a notice or a plan of operations, whichever is applicable under this section.
(i) Are located on lands patented under the Stock Raising Homestead Act and you do not have the written consent of the surface owner,	You must submit a plan of operations and obtain BLM's approval. Where you have surface-owner consent, you do not need a notice or a plan of operations under this subpart. See part 3810, subpart 3814, of this title.

(j) The special status areas where BLM requires a plan of operations for all operations greater than casual use include:

(1) Lands in the California Desert Conservation Area (CDCA) designated by the CDCA plan

as "controlled" or "limited" use areas;

(2) Areas in the National Wild and Scenic Rivers System, and areas designated for potential addition to the system;

(3) Designated Areas of Critical Environmental Concern;

(4) Areas designated as part of the National Wilderness Preservation System and administered by BLM;

(5) Areas designated as "closed" to off-road vehicle use, as defined in §8340.0-5 of this title;

(6) Any areas specifically identified in BLM land-use or activity plans where BLM has determined that a plan of operations is required to provide detailed review of project effects on unique, irreplaceable, or outstanding historical, cultural, recreational, or natural resource values, such as threatened or endangered species or their critical habitat;

(7) National Monuments and National Conservation Areas administered by BLM; and

(8) All areas segregated in anticipation of a mineral withdrawal and all withdrawn areas, except for areas segregated or withdrawn under the Alaska Native Claims Settlement Act, the Alaska National Interest Lands Conservation Act, and the Alaska Statehood Act.

(k) if your operations do not qualify as casual use, you must submit a notice or plan of operations, whichever is applicable.

"Forest Service" Alternative

§3809.11 When does BLM require that I submit a notice of intention to operate or a plan of operations?

To see when you must submit a notice of intention to operate or a plan of operations, follow this table:

If . . .	Then . . .
(a) Your proposed operations-- (1) Are limited to the use of vehicles on existing public roads or roads used and maintained for BLM purposes; (2) Involve individuals desiring to search for and occasionally remove small mineral samples or specimens; (3) Consist of prospecting and sampling that will not cause significant surface resource disturbance and will not involve removal of more than a reasonable amount of mineral deposit for analysis and study; (4) Are limited to marking and monumenting a mining claim; (5) Involve subsurface operations that will not cause significant surface resource disturbance; or (6) Do not involve the use of mechanized earthmoving equipment, such as a bulldozer or a backhoe, and will not involve the cutting of trees;	You do not need to notify BLM or seek permission to conduct your operations. You must reclaim your operations, and BLM may monitor them to ensure that unnecessary or undue degradation does not occur.
(b) You propose to conduct operations that-- (1) Are not described in paragraph (a) of this section; and (2) Might cause disturbance of surface resources,	You must file with BLM a complete notice of intention to operate 15 business days before you plan to start operations. See §§3809.300 to 3809.336.
(c) After reviewing your notice of intention to operate, BLM determines that your operations are likely to cause significant disturbance of surface resources,	You must submit a plan of operations and obtain BLM's approval. See §§3809.400 to 3809.435.

(d) You always have the option to submit a plan of operations in lieu of the notice of intention to operate required under paragraph (b) of this section.

[End of alternative]

§3809.100 What special provisions apply to operations on segregated or withdrawn lands?

(a) Mineral examination report. After the date on which the lands are withdrawn from appropriation under the mining laws, BLM will not approve a plan of operations until BLM has prepared a mineral examination report to determine whether the mining claim was valid before the withdrawal, and whether it remains valid. BLM may require preparation of a mineral examination report before approving operations on segregated lands. If the report concludes that the mining claim is invalid, BLM will not approve operations on the mining claim. BLM will also promptly initiate contest proceedings.

(b) Allowable operations. If BLM has not completed the mineral examination report under paragraph (a) of this section, if the mineral examination report for proposed operations concludes that a mining claim is invalid, or if there is a pending contest proceeding for the mining claim, BLM may--

(1) Approve a plan of operations for the disputed mining claim proposing operations that are limited to taking samples to confirm or corroborate mineral exposures that are physically disclosed and existing on the mining claim before the segregation or withdrawal date, whichever is earlier; and

(2) Approve a plan of operations for the operator to perform the minimum necessary annual assessment work under §3851.1 of this title.

(c) Time limits. While BLM prepares a mineral examination report under paragraph (a) of this section, it may suspend the time limit for responding to a notice for operations in Alaska or acting on a plan of operations. See §§3809.311 and 3809.411, respectively.

(d) Final decision. If a final departmental decision declares a mining claim to be null and void, the operator must cease all operations, except required reclamation.

§3809.101 What special provisions apply to minerals that may be common variety minerals, such as sand, gravel, and building stone?

(a) Mineral examination report. On mining claims located on or after July 23, 1955, you must not initiate operations for minerals that may be "common variety" minerals, as defined in §3711.1(b) of this title, until BLM has prepared a mineral examination report, except as provided in paragraph (b) of this section.

(b) Interim authorization. Until the mineral examination report described in paragraph (a) of this section is prepared, BLM will allow notice-level operations or approve a plan of operations for the disputed mining claim for--

(1) Operations limited to taking samples to confirm or corroborate mineral exposures that are physically disclosed and existing on the mining claim;

(2) Performance of the minimum necessary annual assessment work under §3851.1 of this title; or

(3) Operations to remove possible common variety minerals if you establish an escrow account in a form acceptable to BLM. You must make regular payments to the escrow account for the appraised value of possible common variety minerals removed under a payment schedule approved by BLM. The funds in the escrow account must not be disbursed to the operator or to the U.S. Treasury until a final determination of whether the mineral is a common variety and therefore salable under part 3600 of this title.

(c) Determination of common variety. If the mineral examination report under paragraph (a) of this section concludes that the minerals are common variety minerals, you may either relinquish your mining claim(s) or BLM will initiate contest proceedings. Upon relinquishment or final departmental determination that the mining claim(s) is null and void, you must promptly close and reclaim your operations unless you are authorized to proceed under parts 3600 and 3610 of this title.

(d) Disposal. BLM may dispose of common variety minerals from an unpatented mining claim with a written waiver from the mining claimant.

§3809.111 Public availability of information.

Part 2 of this title applies to all information and data you submit under this subpart. If you submit information or data under this subpart that you believe is exempt from disclosure, you must mark each page clearly "CONFIDENTIAL INFORMATION." You must also separate it from other materials you submit to BLM. BLM will keep confidential information or data marked in this manner to the extent required by part 2 of this title. If you do not mark the information as confidential, BLM, without notifying you, may disclose the information to the public to the full extent allowed under part 2 of this title.

§3809.115 Information collection.

(a) The Office of Management and Budget has approved the collections of information contained in subpart 3809 under 44 U.S.C. 3501 et seq. and assigned clearance number 1004-____. BLM will use this information to regulate and monitor mining and exploration operations on public lands. Response to requests for information is mandatory in accordance with 43 U.S.C. 1701 et seq. The information collection approval expires _____________.

(b) BLM estimates that the public reporting burden for this information averages 8 hours per response for notices and 80 hours per response for plans of operations. This includes reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Information Collection Clearance Officer (783), Bureau of Land Management, Washington, D.C. 20240, and the Office of Management and Budget, Attention Desk Officer for the Interior Department, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, referring to information collection clearance number 1004-____.

§3809.116 As a mining claimant or operator, what are my responsibilities under this subpart for my project area?

(a) Mining claimants and operators (if other than the mining claimant) are jointly and severally liable for obligations under this subpart that accrued while they held their interests. Joint and several liability, in this context, means that the mining claimants and operators are responsible together and individually for obligations, such as reclaiming the project area. In the event obligations are not met, BLM may take any action authorized under this subpart against either the mining claimants or the operators, or both.

(b) Relinquishment, forfeiture, or abandonment of a mining claim does not relieve a mining claimant's or operator's responsibility under this subpart for obligations or conditions created while the mining claimant or operator was responsible for operations conducted on that mining claim or in the project area.

(c) Transfer of a mining claim or operation does not relieve a mining claimant's or operator's responsibility under this subpart for obligations or conditions created while the mining claimant or operator was responsible for operations conducted on that mining claim or in the project area until--

(1) BLM receives documentation that a transferee accepts responsibility, and

(2) BLM accepts an adequate replacement financial guarantee.

FEDERAL/STATE AGREEMENTS

§3809.201 What kinds of agreements may BLM and a State make under this subpart?

To prevent unnecessary administrative delay and to avoid duplication of administration and enforcement, BLM and a State may make the following kinds of agreements:

(a) An agreement to provide for a joint Federal/State program; and

(b) An agreement under §3809.202 which provides that, in place of BLM administration, BLM defers to State administration of some or all of the requirements of this subpart subject to the limitations in §3809.203.

§3809.202 Under what conditions will BLM defer to State regulation of operations?

(a) State request. A State may request BLM enter into an agreement for State regulation of operations on public lands in place of BLM administration of some or all of the requirements of this subpart. The State must send the request to the BLM State Director with jurisdiction over public lands in the State.

(b) BLM review. (1) When the State Director receives the State's request, he/she will notify the public and provide an opportunity for comment. The State Director will then review the request and determine whether the State's requirements are consistent with the requirements of this subpart, and whether the State has necessary legal authorities, resources, and funding for an agreement. The State requirements may be contained in laws, regulations, guidelines, policy manuals, and demonstrated permitting practices.

(2) For the purposes of this subpart, BLM will determine consistency with the requirements of this subpart by comparing this subpart and State standards on a provision-by-provision basis to determine--

(i) Whether non-numerical State standards are functionally equivalent to BLM counterparts; and

(ii) Whether numerical State standards, such as the 5-acre threshold for plans of operations, are the same as corresponding BLM standards, except that State review and approval time frames do not have to be the same as the corresponding Federal time frames.

(3) A State environmental protection standard that exceeds a corresponding Federal standard is consistent with the requirements of this subpart.

(c) State Director decision. The BLM State Director will notify the State in writing of his/her decision regarding the State's request. The State Director will address whether the State requirements are consistent with the requirements of this subpart, and whether the State has necessary legal authorities, resources, and funding to implement any agreement. If BLM determines that the State's requirements are consistent with the requirements of this subpart and the State has the necessary legal authorities, resources, and funding, BLM must enter into an agreement with the State so that the State will regulate some or all of the operations on public lands, as described in the State request.

(d) Appeal of State Director decision. The BLM State Director's decision will be a final decision of BLM and may be appealed to the Assistant Secretary for Land and Minerals Management, but not to the Department of the Interior Office of Hearings and Appeals. See

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§3809.800(c) for the items you should include in the appeal.

§3809.203 What are the limitations on BLM deferral to State regulation of operations?

Any agreement between BLM and a State in which BLM defers to State regulation of some or all operations on public lands is subject to the following limitations:

(a) Plans of Operations. BLM must concur with each State decision approving a plan of operations to assure compliance with this subpart, and BLM retains responsibility for compliance with the National Environmental Policy Act (NEPA). The State and BLM may decide who will be the lead agency in the plan review process, including preparation of NEPA documents.

(b) Federal land-use planning and other Federal laws. BLM will continue to be responsible for all land-use planning on public lands and for implementing other Federal laws relating to the public lands for which BLM is responsible.

(c) Federal enforcement. BLM may take any authorized action to enforce the requirements of this subpart or any term, condition, or limitation of a notice or an approved plan of operations. BLM may take this action regardless of the nature of its agreement with a State, or actions taken by a State.

(d) Financial guarantee. The amount of the financial guarantee must be calculated based on the completion of both Federal and State reclamation requirements, but may be held as one instrument. If the financial guarantee is held as one instrument, it must be redeemable by both the Secretary and the State. BLM must concur in the approval and release of a financial guarantee for public lands.

(e) State performance. If BLM determines that a State is not in compliance with all or part of its Federal/State agreement, BLM will notify the State and provide a reasonable time for the State to comply.

(f) Termination. (1) If a State does not comply after being notified under paragraph (e) of this section, BLM will take appropriate action, which may include termination of all or part of the agreement.

(2) A State may terminate its agreement by notifying BLM 60 days in advance.

§3809.204 Does this subpart cancel an existing agreement between BLM and a State?

No. A Federal/State agreement or memorandum of understanding in effect on **(Insert effective date of the final rule.)** will continue while BLM and the State perform a review to determine whether revisions are required under this subpart. BLM and the State must complete the review and make necessary revisions no later than one year from **(Insert effective date of the final rule.)**

OPERATIONS CONDUCTED UNDER NOTICES

§3809.300 Does this subpart apply to my existing notice-level operations?

To see how this subpart applies to your operations conducted under a notice and existing on (**Insert effective date of the final rule.**), follow this table:

If you are conducting operations under a notice filed before (Insert effective date of the final rule.) and . . .	**Then . . .**
(a) You are the operator identified in the notice on file with BLM on (**Insert effective date of the final rule.**),	You may conduct operations under the terms of your existing notice for 2 years after (**Insert effective date of the final rule.**), or longer if your notice is extended under §3809.333. See §3809.503 for financial guarantee requirements applicable to notices.
(b) You are a new operator, that is, you were not the operator identified in the notice on file with BLM on (**Insert effective date of the final rule.**),	You must conduct operations under the provisions of this subpart, including §3809.320 for 2 years after (**Insert effective date of the final rule.**), unless extended under §3809.333.
(c) Your notice has expired,	You may not conduct operations under an expired notice. You must reclaim your project area immediately or promptly submit a new notice under §3809.301.

§3809.301 Where do I file my notice and what information must I include in it?

(a) If you qualify under §3809.11, you must file your notice with the local BLM office with jurisdiction over the lands involved. BLM does not require that the notice be on a particular form.

(b) To be complete, your notice must include the following information:

(1) Operator Information. The name, mailing address, phone number, social security number or corporate identification number of the operator(s), and the BLM serial number(s) of any unpatented mining claim(s) where the disturbance would occur. If the operator is a corporation, you must identify one individual as the point of contact;

(2) Activity Description, Map, and Schedule of Activities. A description of the proposed activity with a level of detail appropriate to the type, size, and location of the activity. The

description must include the following:

(i) The measures that you will take to prevent unnecessary or undue degradation during operations;

(ii) A map showing the location of your project area in sufficient detail for BLM to be able to find it and the location of access routes you intend to use, improve, or construct;

(iii) A description of the type of equipment you intend to use; and

(iv) A schedule of activities, including the date when you will begin operations and the date by which you will complete reclamation;

(3) Reclamation Plan. A description of how you will complete reclamation to the standards described in §3809.420; and

(4) Reclamation cost estimate. An estimate of the cost to fully reclaim your operations as required by §3809.552; and

(c) BLM may require you to provide additional information, if necessary to ensure that your operations will comply with this subpart.

(d) You must notify BLM in writing within 30 days of any change of operator or corporate point of contact, or of the mailing address of the operator or corporate point of contact.

§3809.311 What action does BLM take when it receives my notice?

(a) Upon receipt of your notice, BLM will review it within 15 business days to see if it is complete under §3809.301.

(b) If your notice is incomplete, BLM will inform you in writing of the additional information you must submit. BLM may also take the actions described in §3809.313.

(c) BLM will review your additional information within 15 business days to ensure it is complete. BLM will repeat this process until your notice is complete.

§3809.312 When may I begin operations after filing a complete notice?

(a) If BLM does not take any of the actions described in §3908.313, you may begin operations no sooner than 15 business days after the appropriate BLM office receives your complete notice. BLM may send you an acknowledgement that indicates the date we received your notice. If you don't receive an acknowledgement or have any doubt about the date we received your notice, contact the office to which you sent the notice. This subpart does not require BLM to approve your notice or inform you that your notice is complete.

(b) If we complete our review sooner than 15 days after receiving your complete notice, we may notify you that you may begin operations.

(c) You must provide a financial guarantee that meets the requirements of this subpart before beginning operations.

(d) Your operations may be subject to BLM approval under part 3710, subpart 3715, of this title relating to use or occupancy of unpatented mining claims.

§3809.313 Under what circumstances may I not begin operations 15 business days after filing my notice?

To see when you may not begin operations 15 business days after filing your notice, follow this table:

If BLM reviews your notice and, within 15 business days, . . .	Then . . .
(a) Notifies you that BLM needs additional time, not to exceed 15 business days, to complete its review,	You must not begin operations until the additional review time period ends.
(b) Notifies you that if you do not modify your notice, your operations will likely cause unnecessary or undue degradation,	You must not begin operations until you modify your notice to ensure that your operations prevent unnecessary or undue degradation.
(c) Requires you to consult with BLM about the location of existing or proposed access routes,	You must not begin operations until you consult with BLM and satisfy BLM's concerns about access.
(d) Determines that an on-site visit is necessary,	You must not begin operations until BLM visits the site, and you satisfy any concerns arising from the visit.
(e) BLM determines you don't qualify under §3809.11 as a notice-level operation,	You must file a plan of operations before beginning operations. See §§3809.400 through 3809.420.

§3809.320 Which performance standards apply to my notice-level operations?

Your notice-level operations must meet all applicable performance standards of §3809.420.

§3809.330 May I modify my notice?

(a) Yes, you may submit a notice modification at any time during operations under a notice.

(b) BLM will review your notice modification the same way it reviewed your initial notice under §§3809.311 and 3809.313.

§3809.331 Under what conditions must I modify my notice?

(a) You must modify your notice--

(1) If BLM requires you to do so to prevent unnecessary or undue degradation; or

(2) If you plan to make material changes to your operations. Material changes include the addition of planned surface disturbance up to the threshold described in §3809.11, undertaking new drilling or trenching activities, or changing reclamation.

(b) You must submit your notice modification 15 business days before making any material changes. If BLM determines your notice modification is complete before the 15-day period has elapsed, BLM may notify you to proceed. When BLM requires you to modify your notice, it may also notify you to proceed before the 15-day period has elapsed to prevent unnecessary or undue degradation.

§3809.332 How long does my notice remain in effect?

If you filed your notice on or after **(Insert effective date of the final rule.)**, it remains in effect for 2 years, unless extended under §3809.333, or unless you notify BLM beforehand that operations have ceased and reclamation is complete. BLM will conduct an inspection to verify whether you have met your obligations, will notify you promptly in writing, and terminate your notice, if appropriate.

§3809.333 May I extend my notice, and, if so, how?

Yes. If you wish to conduct operations for 2 additional years after the expiration date of your notice, you must notify BLM in writing on or before the expiration date. You may extend your notice more than once.

§3809.334 What if I temporarily stop conducting operations under a notice?

(a) If you stop conducting operations for any period of time, you must--

(1) Maintain public lands within the project area, including structures, in a safe and clean condition;

(2) Take all steps necessary to prevent unnecessary or undue degradation; and

(3) Maintain an adequate financial guarantee.

(b) If the period of non-operation is likely to cause unnecessary or undue degradation, BLM will--

(1) Require you to take all steps necessary to prevent unnecessary or undue degradation; and

(2) Require you, after an extended period of non-operation for other than seasonal operations, to remove all structures, equipment, and other facilities and reclaim the project area.

§3809.335 What happens when my notice expires?

(a) When your notice expires, you must--

(1) Cease operations, except reclamation; and

(2) Complete reclamation promptly according to your notice.

(b) Your reclamation obligations continue beyond the expiration or any termination of your notice until you satisfy them.

§3809.336 What if I abandon my notice-level operations?

(a) BLM may consider your operations to be abandoned if, for example, you leave inoperable or non-mining related equipment in the project area, remove equipment and facilities from the project area other than for purposes of completing reclamation according to your reclamation plan, do not maintain the project area, discharge local workers, or there is no sign of activity in the project area over time.

(b) If BLM determines that you abandoned your operations without completing reclamation, BLM may initiate forfeiture under §3809.595. If the amount of the financial guarantee is inadequate to cover the cost of reclamation, BLM may complete the reclamation, and the operator and all other responsible persons are liable for the cost of reclamation.

OPERATIONS CONDUCTED UNDER PLANS OF OPERATIONS

§3809.400 Does this subpart apply to my existing or pending plan of operations?

To see how this subpart applies to your existing or pending plan of operations, follow this table:

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If you submitted your plan of operations to BLM before (Insert effective date of final rule.), and . . .	**Then . . .**
(a) BLM approved your plan of operations before that date,	The performance standards of this subpart (§3809.420) do not apply to your existing plan of operations. The performance standards in effect at the time BLM approved your plan of operations continue to apply. All other provisions of this subpart apply to your plan of operations. See §3809.505 for applicability of financial guarantee requirements.
(b) BLM made an environmental assessment or a draft environmental impact statement available to the public before that date,	The plan content requirements (43 CFR 3809.1-5) and performance standards (43 CFR 3809.1-3(d) and 3809.2-2) that were in effect immediately before (**Insert effective date of final rule.**) apply to your plan of operations. All provisions of this subpart, except §§3809.401 and 3809.420, apply to your plan of operations.
(c) BLM has not yet made an environmental assessment or a draft environmental impact statement available to the public,	All provisions of this subpart apply to your plan of operations.

(d) If you want this subpart to apply to any existing plan of operations, where not otherwise required, you may choose to have this subpart apply.

§3809.401 Where do I file my plan of operations and what information must I include with it?

(a) If you are required to file a plan of operations under §3809.11, you must file it with the local BLM field office with jurisdiction over the lands involved. BLM does not require that the plan be on a particular form.

(b) Operators or mining claimants must demonstrate that the proposed operations would not result in unnecessary or undue degradation of public lands. Your plan of operations must describe fully the proposed activity and contain the following information with a level of detail appropriate to the type, size, and location of the planned activity:

(1) Operator Information. The name, mailing address, phone number, social security number or corporate identification number of the operator(s), and the BLM serial number(s) of any

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unpatented mining claim(s) where disturbance would occur. If the operator is a corporation, you must identify one individual as the point of contact. You must notify BLM in writing within 30 days of any change of operator or corporate point of contact or in the mailing address of the operator or corporate point of contact;

(2) Description of Operations. A detailed description of the equipment, devices, or practices you propose to use during operations including, where applicable--

(i) maps of the project area at an appropriate scale showing the location of exploration activities, drill sites, mining activities, processing facilities, waste rock and tailing disposal areas, support facilities, structures, buildings, and access routes;

(ii) preliminary designs, cross sections, and operating plans for mining areas, processing facilities, and waste rock and tailing disposal facilities;

(iii) water management plans;

(iv) rock characterization and handling plans;

(v) quality assurance plans;

(vi) spill contingency plans;

(vii) a general schedule of operations from start through closure; and

(viii) plans for all access roads, water supply pipelines, and power or utility services;

(3) Reclamation Plan. A plan for reclamation to meet the standards in §3809.420, with a detailed description of the equipment, devices, or practices you propose to use including, where applicable, plans for--

(i) drill-hole plugging;

(ii) regrading and reshaping;

(iii) mine reclamation;

(iv) riparian mitigation;

(v) wildlife habitat rehabilitation;

(vi) topsoil handling;

(vii) revegetation;

(viii) isolation and control of acid, toxic or deleterious materials;

(ix) facilities removal; and

(x) post-closure management;

(4) Monitoring Plan. A plan for monitoring the effect of your operations. You must design monitoring plans to meet the following objectives: to demonstrate compliance with the approved plan of operations and other Federal or State environmental laws and regulations, to provide early detection of potential problems, and to supply information that will assist in directing corrective actions should they become necessary. Where applicable, you must include in monitoring plans details on type and location of monitoring devices, sampling parameters and frequency, analytical methods, reporting procedures, and procedures to respond to adverse monitoring results. Examples of monitoring programs which may be necessary include surface- and ground-water quality and quantity, air quality, revegetation, stability, noise levels, and wildlife mortality;

(c) In addition to the requirements of paragraph (b) of this section, BLM may require you to supply--

(1) Operational and baseline environmental information for BLM to analyze potential environmental impacts as required by the National Environmental Policy Act. BLM will also use this information to determine if your plan of operations will prevent unnecessary or undue degradation. This could include information on public and non-public lands needed to characterize the geology, hydrology, soils, vegetation, wildlife, air quality, cultural resources, and socioeconomic conditions in and around the project area. This may also include requiring static and kinetic testing to characterize the potential for your operations to produce acid drainage or other leachate. BLM can advise you on the exact type of information and level of detail needed to meet these requirements; and

(2) Other information, if necessary to ensure that your operations will comply with this subpart.

(d) Reclamation cost estimate. At a time specified by BLM, you must submit an estimate of the cost to fully reclaim your operations as required by §3809.552.

§3809.411 What action will BLM take when it receives my plan of operations?

(a) BLM will review your plan of operations within 30 business days and will notify you that--

(1) BLM approves your plan of operations as submitted (See part 3810, subpart 3814, of this title for specific plan-related requirements applicable to operations on Stock Raising Homestead Act lands.);

(2) Your plan does not contain a complete description of the proposed operations under §3809.401(b). BLM will identify deficiencies that you must address before BLM can continue processing your plan of operations. If necessary, BLM may repeat this process until your plan of operations is complete;

(3) BLM approves your plan subject to changes or conditions that are necessary to meet the performance standards of §3809.420;

(4) The description of the proposed operations is complete, but BLM cannot approve the plan until certain additional steps are completed, including one or more of the following:

(i) You complete collection of adequate baseline data;

(ii) BLM completes the environmental review, required under the National Environmental Policy Act;

(iii) BLM completes the consultation required under the National Historic Preservation Act or Endangered Species Act;

(iv) BLM or the Department of the Interior completes other Federal responsibilities, such as Native American consultation;

(v) BLM conducts an on-site visit;

(vi) BLM completes review of public comments on the amount of the financial guarantee;

(vii) For public lands where BLM does not have responsibility for managing the surface, BLM consults with the surface-managing agency; and

(viii) In cases where the surface is owned by a non-Federal entity, BLM consults with the surface owner; or

(5) BLM disapproves your plan of operations under paragraph (c) of this section.

(b) Pending final approval of your plan of operations, BLM may approve any operations that may be necessary for timely compliance with requirements of Federal and State laws, subject to any terms and conditions that may be needed to prevent unnecessary or undue degradation.

(c) BLM must disapprove, or withhold approval of, a plan of operations if it--

(1) Does not meet the content requirements of §3809.401;

(2) Proposes operations that are in an area segregated or withdrawn from the operation of the mining laws, unless the requirements of §3809.100 are met; or

(3) Proposes operations that would result in unnecessary or undue degradation of public lands.

(d) Before BLM approves your plan of operations, it will publish in a local newspaper of general circulation or in a NEPA document and accept comments for 30 days on the amount of financial guarantee required and an explanation of the basis for the amount. Detailed calculations will remain part of the record, subject to public inspection.

§3809.412 When may I operate under a plan of operations?

You must not begin operations until BLM approves your plan of operations and you provide the financial guarantee required under §§3809.411(d) and 3809.552.

§3809.415 How do I prevent unnecessary or undue degradation while conducting operations on public lands?

You prevent unnecessary or undue degradation while conducting operations on public lands by--

(a) Complying with §3809.420, as applicable; the terms and conditions of your approved plan of operations; the operations described in your notice; and other Federal and State laws related to environmental protection and protection of cultural resources;

(b) Assuring that your operations are "reasonably incident," as defined in §3715.0-5 of this title; and

(c) Attaining the stated level of protection or reclamation required by specific laws in areas such as the California Desert Conservation Area, Wild and Scenic Rivers, BLM-administered portions of the National Wilderness System, and BLM-administered National Monuments and National Conservation Areas.

§3809.420 What performance standards apply to my notice or plan of operations?

The following performance standards apply to your notice or plan of operations:

(a) General performance standards.

(1) Technology and practices. You must use MATP to meet the standards of this subpart.

(2) Sequence of operations. You must avoid unnecessary impacts by following a reasonable and customary mineral exploration, development, mining and reclamation sequence.

(3) Land-use plans. Consistent with the mining laws, your operations and post-mining land use must comply with the applicable BLM land-use plans and activity plans, and with coastal

zone management plans under 16 U.S.C. 1451, as appropriate.

(4) Mitigation. You must take mitigation measures specified by BLM to protect public lands.

(5) Concurrent reclamation. You must initiate and complete reclamation at the earliest feasible time on those portions of the disturbed area that you will not disturb further.

(b) Environmental performance standards.

(1) Air quality. Your operations must comply with applicable Federal, Tribal, and State laws and requirements.

(2) Water. You must conduct operations to minimize water pollution (source control) in preference to water treatment. You must conduct operations to minimize changes in water quantity in preference to water supply replacement. Your operations must comply with State water law with respect to water use and water quality.

(i) Surface water. (A) Releases to surface waters must comply with applicable Federal, Tribal, and State laws and requirements.

(B) You must handle earth materials and water in a manner that minimizes the formation of acidic, toxic, or other deleterious pollutants of surface water systems.

(C) You must manage excavations and other disturbances to prevent or control the discharge of pollutants into surface waters.

(ii) Ground water. (A) Ground water affected by your operations must comply with State standards and other applicable requirements.

(B) You must handle earth materials and water in a manner that minimizes the formation of acidic, toxic, or other deleterious infiltration to ground water systems and manage excavations and other disturbances to minimize the discharge of pollutants into ground water.

(C) You must conduct operations affecting ground water, such as dewatering, pumping, and injecting, to minimize impacts on surface and other natural resources, such as wetlands, riparian areas, aquatic habitat, and other features that are dependent on ground water.

(3) Wetlands and riparian areas. (i) You must avoid locating operations in wetlands and riparian areas where possible, minimize impacts on wetlands and riparian areas that your operations cannot avoid, and mitigate damage to wetlands and riparian areas that your operations impact.

(ii) Where feasible, you must return disturbed wetlands and riparian areas to a properly functioning condition. Wetlands and riparian areas are functioning properly when adequate vegetation, land form, or large woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve floodwater retention and ground-water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses, and support greater biodiversity.

(iii) You must take appropriate mitigation measures, such as restoration or replacement, if your operations cause the loss of nonjurisdictional wetland or riparian areas or the diminishment of their proper functioning condition.

(iv) You must mitigate impacts to wetlands under the jurisdiction of the U.S. Army Corps of Engineers (COE) and other waters of the United States in accord with COE requirements.

(4) Soil and growth material. (i) You must remove, segregate, and preserve topsoil, or where more feasible other suitable growth material, to minimize erosion and sustain revegetation when reclamation begins.

(ii) To preserve soil viability and promote concurrent reclamation, you must directly transport topsoil from its original location to the point of reclamation without intermediate stockpiling, where feasible.

(5) Revegetation. You must--

(i) Revegetate disturbed lands by establishing a stable and long-lasting vegetative cover that is self-sustaining and, considering successional stages, will result in cover that is--

(A) Comparable in both diversity and density to pre-existing natural vegetation of the surrounding area; or

(B) Compatible with the approved BLM land-use plan or activity plan;

(ii) Take all reasonable steps to prevent the introduction of noxious weeds and to limit or reduce any existing infestations;

(iii) Use native species to the extent feasible;

(iv) Achieve success over the time frame approved by BLM; and

(v) Where you demonstrate revegetation is not achievable under this paragraph, you must use other techniques to prevent erosion and stabilize the project area, subject to BLM approval.

(6) Fish and wildlife. (i) You must minimize disturbances and adverse impacts on fish, wildlife, and related environmental values.

(ii) You must take necessary measures to protect threatened or endangered species and their habitat as required by the Endangered Species Act.

(iii) You must take any necessary action to minimize the adverse effects of your operations, including access, on BLM-defined special status species.

(iv) You must rehabilitate fisheries and wildlife habitat affected by your operations.

(7) Cultural, paleontologic, and cave resources. (i) You must not knowingly disturb, alter, injure, or destroy any scientifically important paleontologic remains or any historic, archaeologic, or cave-related site, structure, building, resource, or object unless --

(A) You identify the resource in your notice or plan of operations;

(B) You propose action to protect, remove or preserve the resource; and

(C) BLM specifically authorizes such action in your plan of operations, or does not prohibit such action under your notice.

(ii) You must immediately bring to BLM's attention any previously unidentified historic, archaeologic, cave-related, or scientifically important paleontologic resources that might be altered or destroyed by your operations. You must leave the discovery intact until BLM authorizes you to proceed. BLM will evaluate the discovery and take action to protect, remove, or preserve the resource within 20 business days after you notify BLM of the discovery, unless otherwise agreed to by the operator and BLM, or unless otherwise provided by law.

(iii) BLM has the responsibility for determining who bears the cost of the investigation, recovery, and preservation of discovered historic, archaeologic, cave-related, and paleontologic resources, or of any human remains and associated funerary objects. If BLM incurs costs associated with investigation and recovery, BLM will recover the costs from the operator on a case-by-case basis, after an evaluation of the factors set forth in section 304(b) of FLPMA.

(c) Operational performance standards.

(1) Roads and structures. (i) You must design, construct, and maintain roads and structures to control or prevent erosion, siltation, and air pollution and minimize impacts to resources.

(ii) You must minimize surface disturbance, using existing access where feasible, while maintaining safe design, following natural contour where feasible, and minimizing cut and fill.

(iii) When commercial hauling on an existing BLM road is involved, BLM may require you to make appropriate arrangements for use, maintenance, and safety.

(iv) You must remove and reclaim roads and structures according to BLM land-use plans and activity plans, unless retention is approved by BLM.

(2) Drill holes. (i) You must not allow drilling fluids and cuttings to flow off the drill site.

(ii) You must plug all exploration drill holes to prevent mixing of waters from aquifers, impacts to beneficial uses, downward water loss, or upward water loss from artesian conditions.

(iii) You must conduct surface plugging to prevent direct inflow of surface water into the drill hole and to eliminate the open hole as a hazard.

(3) Acid-forming, toxic, or other deleterious materials. You must incorporate identification, handling, and placement of potentially acid-forming, toxic or other deleterious materials into your operations, facility design, reclamation, and environmental monitoring programs to minimize the formation and impacts of acidic, alkaline, metal-bearing, or other deleterious leachate, including the following:

(i) You must handle, place, or treat potentially acid-forming, toxic, or other deleterious materials in a manner that minimizes the likelihood of acid formation and toxic and other deleterious leachate generation (source control);

(ii) If you cannot prevent the formation of acid, toxic, or other deleterious drainage, you must minimize uncontrolled migration of leachate; and

(iii) You must capture and treat acid drainage, or other undesirable effluent, to the applicable standard if source controls and migration controls do not prove effective. You are responsible for any costs associated with water treatment or facility maintenance after project closure. Long-term, or post-mining, effluent capture and treatment are not acceptable substitutes for source control, and you may rely on them only after all reasonable source control methods have been employed.

(4) Leaching Operations and Impoundments. (i) You must design, construct, and operate all leach pads, tailings impoundments, ponds, and solution-holding facilities according to standard engineering practices to achieve and maintain stability and facilitate reclamation.

(ii) You must construct a low-permeability liner or containment system that will minimize the release of leaching solutions to the environment. You must monitor to detect potential releases of contaminants from heaps, process ponds, tailings impoundments, and other structures and remediate environmental impacts if leakage occurs.

(iii) You must design, construct, and operate cyanide or other leaching facilities and impoundments to contain precipitation from the local 100-year, 24-hour storm event in addition to the maximum process solution inventory. You must also include allowances for snowmelt events and draindown from heaps during power outages in the design.

(iv) You must construct a secondary containment system around vats, tanks, or recovery circuits adequate to prevent the release of toxic solutions to the environment in the event of primary containment failure.

(v) You must exclude access by the public, wildlife, or livestock to solution containment and transfer structures that contain lethal levels of cyanide or other solutions.

(vi) During closure and at final reclamation, you must detoxify leaching solutions and heaps and manage tailings or other process waste to minimize impacts to the environment from contact with toxic materials or leachate. Acceptable practices include natural degradation, rinsing, chemical treatment, or equally successful alternative methods to detoxify solutions and materials. Upon completion of reclamation, all materials and discharges must meet applicable standards.

(vii) In cases of temporary or seasonal closure, you must provide adequate maintenance, monitoring, security, and financial guarantee, and BLM may require you to detoxify process solutions.

(5) Waste rock, tailings, and leach pads. You must locate, design, construct, operate, and reclaim waste rock, tailings, and leach pads to minimize infiltration and contamination of surface water and ground water; achieve stability; and, to the extent feasible, blend with pre-mining, natural topography.

(6) Stability, grading and erosion control. (i) You must grade or otherwise engineer all disturbed areas to a stable condition to minimize erosion and facilitate revegetation.

(ii) You must recontour all areas to blend with pre-mining, natural topography to the extent feasible. You may temporarily retain a highwall or other mine workings in a stable condition to preserve evidence of mineralization.

(iii) You must minimize erosion during all phases of operations.

(7) Pit reclamation. (i) You must partially or fully backfill pits unless you demonstrate to BLM's satisfaction it is not feasible for economic, environmental, or safety reasons.

(ii) You must take mitigation measures if you do not completely backfill a pit or other disturbance.

(iii) Water quality in pits and other water impoundments must comply with applicable Federal, State, and Tribal standards. Where no standards exist, you must take measures to protect wildlife, domestic livestock, and public water supplies and users.

(8) Solid waste. (i) You must comply with applicable Federal and State standards for the disposal and treatment of solid waste, including regulations issued under the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.).

(ii) To the extent feasible, you must remove from the project area, dispose of, or treat all non-mine garbage, refuse, or waste to minimize their impact.

(9) Fire prevention and control. You must comply with all applicable Federal and State fire laws and regulations, and take all reasonable measures to prevent and suppress fires in the project area.

(10) Maintenance and public safety. During all operations and after mining--

(i) You must maintain structures, equipment, and other facilities in a safe and orderly manner;

(ii) You must mark by signs or fences, or otherwise identify hazardous sites or conditions resulting from your operations to alert the public in accord with applicable Federal and State laws and regulations; and

(iii) You must restrict unaccompanied public access to portions of your operations that present a hazard to the public, consistent with §§3809.600 and 3712.1 of this title.

(11) Protection of survey monuments. (i) To the extent feasible, you must protect all survey monuments, witness corners, reference monuments, bearing trees, and line trees against damage or destruction.

(ii) If you damage or destroy a monument, corner, or accessory, you must immediately report the matter to BLM. BLM will tell you in writing how to restore or re-establish a damaged or destroyed monument, corner, or accessory.

§3809.423 How long does my plan of operations remain in effect?

Your plan of operations remains in effect as long as you are conducting operations, unless BLM suspends or revokes your plan of operations for failure to comply with this subpart.

§3809.424 What are my obligations if I stop conducting operations?

(a) To see what you must do if you stop conducting operations, follow this table:

If . . .	Then . . .
(1) You stop conducting operations for any period of time,	You must-- (i) Maintain the project area, including structures, in a safe and clean condition; (ii) Take all necessary actions to assure that unnecessary or undue degradation does not occur, including those specified at §3809.420(c)(4)(vii); and (iii) Maintain an adequate financial guarantee.
(2) The period of non-operation is likely to cause unnecessary or undue degradation,	BLM will require you to take all necessary actions to assure that unnecessary or undue degradation does not occur, including requiring you, after an extended period of non-operation for other than seasonal operations, to remove all structures, equipment, and other facilities and reclaim the project area.
(3) Your operations are inactive for 5 consecutive years,	BLM will review your operations and determine whether BLM should terminate your plan of operations and direct final reclamation and closure.
(4) BLM determines that you abandoned your operations,	BLM may initiate forfeiture under §3809.595. If the amount of the financial guarantee is inadequate to cover the costs of reclamation, BLM may complete the reclamation, and the operator and all other responsible persons are liable for the costs of such reclamation. See §3809.336(a) for indicators of abandonment.

(b) Your reclamation and closure obligations continue until satisfied.

MODIFICATIONS OF PLANS OF OPERATIONS

§3809.430 May I modify my plan of operations?

Yes. You may request a modification of the plan at any time during operations under an approved plan of operations.

§3809.431 When must I modify my plan of operations?

(a) You must modify your plan of operations to reflect proposed operations not described in the approved plan; and

(b) You must modify your plan of operations when required by BLM to prevent unnecessary or undue degradation.

§3809.432 What process will BLM follow in reviewing a modification of my plan of operations?

(a) BLM will review and approve a modification of your plan of operations in the same manner as it reviewed and approved your initial plan under §§3809.401 through 3809.420, except that BLM may not obtain public comment on the financial guarantee amount if the modification does not change the financial guarantee amount or only changes it minimally; or

(b) BLM will accept the modification without formal approval if it does not constitute a substantive change and does not require additional analysis under the National Environmental Policy Act.

§3809.433 Does this subpart apply to a new modification of my plan of operations?

To see how this subpart applies to a new modification of your plan of operations, see the following table. A "new" modification is one that you submit to BLM after this subpart becomes effective:

If you have an approved plan of operations on (Insert effective date of the final rule.) and . . .	Then . . .
(a) New facility. You subsequently propose to modify your plan of operations by constructing a new facility, such as waste rock repository, leach pad, impoundment, drill site, or road,	The plan contents requirements (§3809.401) and performance standards (§3809.420) of this subpart apply to the new facility. Those facilities and areas not included in the modification may continue to operate under the terms of your existing plan of operations.

If you have an approved plan of operations on (Insert effective date of the final rule.) and . . .	**Then . . .**
(b) Existing facility. You subsequently propose to modify your plan of operations by modifying an existing facility, such as expansion of a waste rock repository, leach pad, or impoundment; layback of a mine pit; or widening of a road,	The plan contents requirements (§3809.401) and performance standards (§3809.420) of this subpart apply to the modified facility, unless you demonstrate to BLM's satisfaction it is not feasible to apply them for environmental, safety, or technical reasons. If you make the demonstration, the plan content requirements (43 CFR 3809.1-5) and performance standards (43 CFR 3809.1-3(d) and 3809.2-2) that were in effect immediately before **(Insert effective date of final rule.)** apply to your modified facility. Those facilities and areas not included in the modification may continue to operate under the terms of your existing plan of operations.

§3809.434 Does this subpart apply to a pending modification for a new facility?

To see how this subpart applies to a pending modification for a new facility, see the following table. A "pending" modification is one that you submitted to BLM before this subpart became effective, and BLM has not yet approved it.

If you have an approved plan of operations on (Insert effective date of the final rule.) and before that date, you submitted to BLM a proposed modification to construct a new facility, such as waste rock repository, leach pad, impoundment, drill site, or road and . . .	**Then . . .**
(a) BLM made an environmental assessment or a draft environmental impact statement available to the public before that date,	The plan content requirements (43 CFR 3809.1-5) and performance standards (43 CFR 3809.1-3(d) and 3809.2-2) that were in effect immediately before **(Insert effective date of final rule.)** apply to the new facility. Those facilities and areas not included in the modification may continue to operate under the terms of your existing plan of operations.

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If you have an approved plan of operations on (Insert effective date of the final rule.) and before that date, you submitted to BLM a proposed modification to construct a new facility, such as waste rock repository, leach pad, impoundment, drill site, or road and . . .	**Then . . .**
(b) BLM has not yet made an environmental assessment or a draft environmental impact statement available to the public,	All provisions of this subpart apply to the modified facility. Those facilities and areas not included in the modification may continue to operate under the terms of your existing plan of operations.

§3809.435 Does this subpart apply to my pending modification for an existing facility?

To see how this subpart applies to your pending modification for an existing facility, follow this table:

If you have an approved plan of operations on (Insert effective date of the final rule.) and before that date, you submitted to BLM a proposed modification of an existing facility, such as expansion of a waste rock repository, leach pad, or impoundment; layback of a mine pit; or widening of a road, and . . .	**Then . . .**
(a) BLM made an environmental assessment or a draft environmental impact statement available to the public before that date,	The plan content requirements (43 CFR 3809.1-5) and performance standards (43 CFR 3809.1-3(d) and 3809.2-2) that were in effect immediately before (**Insert effective date of final rule.**) apply to the new facility. Those facilities and areas not included in the modification may continue to operate under the terms of your existing plan of operations.

If you have an approved plan of operations on (Insert effective date of the final rule.) and before that date, you submitted to BLM a proposed modification of an existing facility, such as expansion of a waste rock repository, leach pad, or impoundment; layback of a mine pit; or widening of a road, and . . .	**Then . . .**
(b) BLM has not yet made an environmental assessment or a draft environmental impact statement available to the public,	The plan contents requirements (§3809.401) and performance standards (§3809.420) of this subpart apply to the modified facility, unless you demonstrate to BLM's satisfaction it is not feasible to apply them for environmental, safety, or technical reasons. If you make the demonstration, the plan content requirements (43 CFR 3809.1-5) and performance standards (43 CFR 3809.1-3(d) and 3809.2-2) that were in effect immediately before (**Insert effective date of final rule.**) apply to your plan of operations. Those facilities and areas not included in the modification may continue to operate under the terms of your existing plan of operations.

FINANCIAL GUARANTEE REQUIREMENTS--GENERAL

§3809.500 In general, what are BLM's financial guarantee requirements?

To see generally what BLM's financial guarantee requirements are, follow this table:

If . . .	**Then . . .**
(a) Your operations constitute casual use,	You do not have to provide any financial guarantee.
(b) You conduct operations under a notice or a plan of operations,	You must provide BLM or the State a financial guarantee that meets the requirements of this subpart before starting operations. For more information, see §§3809.551 to 3809.573.

§3809.503 When must I provide a financial guarantee for my notice-level operations?

To see how this subpart applies to your notice, follow this table :

If . . .	Then . . .
(a) Your notice was on file with BLM on (**Insert effective date of final rule.**),	You do not need to provide a financial guarantee unless you modify the notice or extend the notice under §3809.333.
(b) Your notice was on file with BLM before (**Insert effective date of final rule.**) and you choose to modify your notice as required by this subpart on or after that date,	You must provide a financial guarantee before you can begin operations under the modified notice.
(c) You file a new notice on or after (**Insert effective date of final rule.**),	You must provide a financial guarantee before you can begin operations under the notice.

§3809.505 How do the financial guarantee requirements of this subpart apply to my existing plan of operations?

For each plan of operations approved before (**Insert effective date of final rule.**), you must post a financial guarantee according to the requirements of this subpart no later than (**Insert date 180 days after effective date of final rule.**) at the local BLM office with jurisdiction over the lands involved.

§3809.551 What are my choices for providing BLM with a financial guarantee?

You must provide BLM with a financial guarantee using any of the 3 options in the following table:

If . . .	Then . . .
(a) You have only one notice or plan of operations, or wish to provide a financial guarantee for a single notice or plan of operations,	You may provide an individual financial guarantee that covers only the cost of reclaiming areas disturbed under the single notice or plan of operations. See §§3809.552 to 3809.556 for more information.
(b) You are currently operating under more than one notice or plan of operations,	You may provide a blanket financial guarantee covering statewide or nationwide operations. See §3809.560 for more information.

If . . .	Then . . .
(c) You do not choose one of the options in paragraphs (a) and (b) of this section,	You may provide evidence of an existing financial guarantee under State law or regulations. See §§3809.570 to 3809.573 for more information.

INDIVIDUAL FINANCIAL GUARANTEE

§3809.552 What must my individual financial guarantee cover?

(a) If you conduct operations under a notice or a plan of operations and you provide an individual financial guarantee, it must cover the estimated cost as if BLM were to contract with a third party to reclaim your operations according to the reclamation plan, including construction and maintenance costs for any treatment facilities necessary to meet Federal and State environmental standards.

(b) BLM will periodically review the estimated cost of reclamation and the adequacy of any funding mechanism established under paragraph (c) of this section and require increased coverage, if necessary.

(c) When BLM identifies a need for it, you must establish a trust fund or other funding mechanism available to BLM to ensure the continuation of long-term treatment to achieve water quality standards and for other long term, post-mining maintenance requirements. The funding must be adequate to provide for construction, long-term operation, maintenance, or replacement of any treatment facilities and infrastructure, for as long as the treatment and facilities are needed after mine closure. BLM may identify the need for a trust fund or other funding mechanism during plan review or later.

§3809.553 May I post a financial guarantee for a part of my operations?

(a) Yes, BLM may authorize you to provide a financial guarantee covering a part of your operations if--

(1) Your operations do not go beyond what is specifically covered by the partial financial guarantee; and

(2) The partial financial guarantee covers all reclamation costs within the incremental area of operations.

(b) BLM will review the amount and terms of the financial guarantee for each increment of your operations at least annually.

§3809.554 How do I estimate the cost to reclaim my operations?

(a) You must estimate the cost to reclaim your operations as if BLM were hiring a third-party contractor to perform reclamation of your operations after you have vacated the project area. Your estimate must include BLM's cost to administer the reclamation contract. Contact BLM to obtain this administrative cost information.

(b) Your estimate of the cost to reclaim your operations must be acceptable to BLM.

§3809.555 What forms of individual financial guarantee are acceptable to BLM?

You may use any of the following instruments for an individual financial guarantee, provided that the BLM State Director has determined that it is an acceptable financial instrument within the State where the operations are proposed:

(a) Non-cancelable surety bonds, including surety bonds arranged or paid for by third parties;

(b) Cash in an amount equal to the required dollar amount of the financial guarantee, to be deposited and maintained in a Federal depository account of the United States Treasury by BLM;

(c) Irrevocable letters of credit from a bank or financial institution organized or authorized to transact business in the United States;

(d) Certificates of deposit or savings accounts not in excess of the maximum insurable amount as set by the Federal Deposit Insurance Corporation; and

(e) Either of the following instruments having a market value of not less than the required dollar amount of the financial guarantee and maintained in a Securities Investors Protection Corporation insured trust account by a licensed securities brokerage firm for the benefit of the Secretary of the Interior, acting by and through BLM:

(1) Negotiable United States Government, State and Municipal securities or bonds; or

(2) Investment-grade rated securities having a Standard and Poor's rating of AAA or AA or an equivalent rating from a nationally recognized securities rating service.

§3809.556 What special requirements apply to financial guarantees described in §3809.555(e)?

(a) If you choose to use the instruments permitted under §3809.555(e) in satisfaction of financial guarantee requirements, you must provide BLM, before you begin operations and by the end of each calendar year thereafter, a certified statement describing the nature and market value of the instruments maintained in that account, and including any current statements or reports furnished by the brokerage firm to the operator or mining claimant concerning the asset value of the account.

(b) You must review the market value of the account instruments by December 31 of each year to ensure that their market value continues to be not less than the required dollar amount of the financial guarantee. When the market value of the account instruments has declined by more than 10 percent of the required dollar amount of the financial guarantee, you must, within 10 days after its annual review or at any time upon the written request of BLM, provide additional instruments, as defined in §3809.555(e), to the trust account so that the total market value of all account instruments is not less than the required dollar amount of the financial guarantee. You must send a certified statement to BLM within 45 days thereafter describing your actions to raise the market value of its account instruments to the required dollar amount of the financial guarantee. You must include copies of any statements or reports furnished by the brokerage firm to you documenting such an increase.

(c) If your review under paragraph (b) of this section demonstrates that the total market value of trust account instruments exceeds 110 percent of the required dollar amount of the financial guarantee, you may ask BLM to authorize a written release of that portion of the account that exceeds 110 percent of the required financial guarantee. BLM will approve your request only if you are in compliance with the terms and conditions of your notice or approved plan of operations.

BLANKET FINANCIAL GUARANTEE

§3809.560 Under what circumstances may I provide a blanket financial guarantee?

(a) If you have more than one notice- or plan-level operation underway, you may provide a blanket financial guarantee covering statewide or nationwide operations instead of individual financial guarantees for each operation.

(b) BLM will accept a blanket financial guarantee if we determine that its terms and conditions are sufficient to comply with the regulations of this subpart.

STATE-APPROVED FINANCIAL GUARANTEE

§3809.570 Under what circumstances may I provide a State-approved financial guarantee?

When you provide evidence of an existing financial guarantee under State law or regulations that covers your operations, you are not required to provide a separate financial guarantee under this subpart if--

(a) The existing financial guarantee is redeemable by the Secretary, acting by and through BLM;

(b) It is held or approved by a State agency for the same operations covered by your notice(s) or plan(s) of operations; and

(c) It provides at least the same amount of financial guarantee as required by this subpart.

§3809.571 What forms of State-approved financial guarantee are acceptable to BLM?

You may provide a State-approved financial guarantee in any of the following forms, subject to the conditions in §3809.570:

(a) The kinds of individual financial guarantees specified under §3809.555;

(b) Participation in a State bond pool, if--

(1) The State agrees that, upon BLM's request, the State will use part of the pool to meet reclamation obligations on public lands; and

(2) The BLM State Director determines that the State bond pool provides the equivalent level of protection as that required by this subpart; and

(c) A corporate guarantee if--

(1) The corporate guarantee is acceptable to the State;

(2) The corporate guarantee is redeemable by or guaranteed to the Secretary; and

(3) The BLM State Director determines that the corporate guarantee provides a level of protection equal to the estimated cost of reclamation under §§3809.552 and 3809.554, considering the operator's net income, net working capital and intangible net worth, and total liabilities and assets.

§3809.572 What happens if BLM rejects a financial instrument in my State-approved financial guarantee?

If BLM rejects a submitted financial instrument in an existing State-approved financial guarantee, BLM will notify you in writing, with a complete explanation of the reasons for the rejection within 30 days of BLM's receipt of the evidence of State-approved financial guarantee. You must provide BLM with a financial guarantee acceptable under this subpart at least equal to the amount of the rejected financial instrument.

§3809.573 What happens if the State makes a demand against my financial guarantee?

When the State makes a demand against your financial guarantee, thereby reducing the available balance, you must replace or augment the financial guarantee if the available balance is insufficient to cover the remaining reclamation cost.

MODIFICATION OR REPLACEMENT OF A FINANCIAL GUARANTEE

§3809.580 What happens if I modify my notice or approved plan of operations?

In the event you modify a notice or an approved plan under §3809.331 or §3809.431 respectively and your estimated reclamation cost increases, your revised financial guarantee must comply with §3809.552. You must adjust the amount of the financial guarantee to cover the estimated additional cost of reclamation and long-term treatment, as modified.

§3809.581 Will BLM accept a replacement financial instrument?

Yes. If you or a new operator have an approved financial guarantee, you may request BLM to accept a replacement financial instrument at any time after the approval of an initial instrument. BLM will review the offered instrument for adequacy and may reject any offered instrument, but will do so by a decision in writing, with a complete explanation of the reasons for the rejection, within 30 days of the offering.

§3809.582 How long must I maintain my financial guarantee?

You must maintain your financial guarantee until you or a new operator replace it, with BLM's written concurrence, by another adequate financial guarantee, or until BLM releases the requirement to maintain your financial guarantee after you have completed reclamation of your operation according to the requirements of §3809.320 (for notices), including any measures identified as the result of consultation with BLM under §3809.313, or §3809.420 (for plans of operations).

RELEASE OF FINANCIAL GUARANTEE

§3809.590 When will BLM release or reduce the financial guarantee for my notice or plan of operations?

(a) When you (the mining claimant or operator) have completed all or any portion of the reclamation of your operations in accordance with your notice or approved plan of operations, you may notify BLM that the reclamation has occurred and request a reduction in the financial guarantee or BLM approval of the adequacy of the reclamation, or both.

(b) BLM will then promptly inspect the reclaimed area. We encourage you to accompany the BLM inspector.

(c) BLM will publish notice of final financial guarantee release in a local newspaper of general circulation and accept comments for 30 days. Subsequently, BLM will notify you, in writing, whether you may reduce the financial guarantee under §3809.591, or the reclamation is acceptable, or both.

§3809.591 What are the limitations on the amount by which BLM may reduce my financial guarantee?

(a) This section applies to your financial guarantee, but not to any funding mechanism established under §3809.552(c) to pay for long-term treatment of effluent or site maintenance. Calculation of bond percentages in paragraphs (b) and (c) of this section does not include any funds held in that kind of funding mechanism.

(b) BLM may release up to 60 percent of your financial guarantee for a portion of your project area when BLM determines that you have successfully completed backfilling; regrading; establishment of drainage control; and stabilization and detoxification of leaching solutions, heaps, tailings, and similar facilities on that portion of the project area.

(c) BLM may release the remainder of your financial guarantee for the same portion of the project area when BLM determines that you have successfully completed reclamation, including revegetating the area disturbed by operations, and when--

(1) Any effluent discharged from the area has met applicable effluent limitations and water quality standards for one year without needing additional treatment; or

(2) If you have established a funding mechanism under §3809.552(c) to pay for long-term treatment, any effluent discharged from the area meets applicable effluent limitations and water quality standards water for one year with or without treatment.

§3809.592 Does release of my financial guarantee relieve me of all responsibility for my project area?

(a) Release of your financial guarantee under this subpart does not release you (the mining claimant or operator) from responsibility for reclamation of your operations should reclamation fail to meet the standards of this subpart.

(b) Any release of your financial guarantee under this subpart does not release or waive any claim BLM or other persons may have against any person under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq., or under any other applicable statutes or regulations.

§3809.593 What happens to my financial guarantee if I transfer my operations?

You remain responsible for obligations or conditions created while you conducted operations unless a transferee accepts responsibility under §3809.16, and BLM accepts an adequate replacement financial guarantee. Therefore, your financial guarantee remains in effect until BLM determines that you are no longer responsible for all or part of the operation. BLM can release your financial guarantee on an incremental basis. The new operator must provide a financial guarantee before BLM will allow the new operator to conduct operations.

§3809.594 What happens to my financial guarantee when my mining claim is patented?

(a) When your mining claim is patented, BLM will release the portion of the financial guarantee that applies to operations within the boundaries of the patented land. This paragraph does not apply to patents issued on mining claims within the boundaries of the California Desert Conservation Area.

(b) BLM will release the remainder of the financial guarantee, including the portion covering approved means of access outside the boundaries of the mining claim, when you have completed reclamation to the standards of this subpart.

(c) BLM will continue to regulate under this subpart existing access for mining purposes across public lands to patented mining claims, including the requirement to have an adequate financial guarantee.

FORFEITURE OF FINANCIAL GUARANTEE

§3809.595 When will BLM initiate forfeiture of my financial guarantee?

BLM will initiate forfeiture of all or part of your financial guarantee for any project area or portion of a project area if--

(a) You (the operator or mining claimant) refuse or are unable to conduct reclamation as provided in the reclamation measures incorporated into your notice or approved plan of operations or the regulations in this subpart;

(b) You fail to meet the terms of your notice or the decision approving your plan of operations; or

(c) You default on any of the conditions under which you obtained the financial guarantee.

§3809.596 How does BLM initiate forfeiture of my financial guarantee?

When BLM decides to require the forfeiture of all or part of your financial guarantee, BLM will notify you (the operator or mining claimant) by certified mail, return receipt requested; the surety on the financial guarantee, if any; and the State agency holding the financial guarantee, if any, informing you and them of the following:

(a) BLM's decision to require the forfeiture of all or part of the financial guarantee;

(b) The reasons for the forfeiture;

(c) The amount that you will forfeit based on the estimated total cost of achieving the reclamation plan requirements for the project area or portion of the project area affected, including BLM's administrative costs; and

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(d) How you may avoid forfeiture, including--

(1) Providing a written agreement under which you or another person will perform reclamation operations in accordance with a compliance schedule which meets the conditions of your notice or the decision approving your plan of operations and the reclamation plan, and a demonstration that such other person has the ability to satisfy the conditions; and

(2) Obtaining written permission from BLM for a surety to complete the reclamation, or the portion of the reclamation applicable to the bonded phase or increment, if the surety can demonstrate an ability to complete the reclamation in accordance with the reclamation measures incorporated in your notice or approved plan of operations.

§3809.597 What if I do not comply with BLM's forfeiture notice?

If you fail to meet the requirements of BLM's forfeiture notice provided under §3809.596, if you fail to appeal the forfeiture notice under §3809.800, or if the decision appealed is affirmed, BLM will--

(a) Immediately collect the forfeited amount as provided by applicable laws for the collection of defaulted financial guarantees, other debts, or State bond pools; and

(b) Use funds collected from financial guarantee forfeiture to implement the reclamation plan, or portion thereof, on the area or portion of the area to which financial guarantee coverage applies.

§3809.598 What if the amount forfeited will not cover the cost of reclamation?

If the amount forfeited is insufficient to pay for the full cost of reclamation, the operators and mining claimants are jointly and severally liable for the remaining costs. BLM may complete or authorize completion of reclamation of the area covered by the financial guarantee and may recover from you all costs of reclamation in excess of the amount forfeited.

§3809.599 What if the amount forfeited exceeds the cost of reclamation?

If the amount of financial guarantee forfeited is more than the amount necessary to complete reclamation, BLM will return the unused funds within a reasonable amount of time to the party from whom they were collected.

INSPECTION AND ENFORCEMENT

§3809.600 With what frequency will BLM inspect my operations?

(a) At any time, BLM may inspect your operations, including all structures, equipment, workings, and uses located on the public lands. The inspection may include verification that your operations comply with this subpart. See §3715.7 of this title for special provisions governing inspection of the inside of structures used solely for residential purposes.

(b) BLM may authorize a member(s) of the public to accompany a BLM inspector. However, BLM will not authorize a member of the public to accompany an inspector if the presence of the public would materially interfere with the mining operations or with BLM's administration of this subpart, or create safety problems. When BLM authorizes a member of the public to accompany the inspector, the operator must provide access to operations.

(c) At least 4 times each year, BLM will inspect your operations if you use cyanide or other leachate or where there is significant potential for acid drainage.

§3809.601 What types of enforcement action may BLM take if I do not meet the requirements of this subpart?

BLM may issue various types of enforcement orders, including the following:

(a) Noncompliance order. If your operations do not comply with any provision of your notice, plan of operations, or requirement of this subpart, BLM may issue you a noncompliance order; and

(b) Suspension orders. (1) BLM may order a suspension of all or any part of your operations after--

(i) You fail to timely comply with a noncompliance order for a significant violation issued under paragraph (a) of this section. A significant violation is one that causes or may result in environmental or other harm or danger or that substantially deviates from the complete notice or approved plan of operations;

(ii) BLM notifies you of its intent to issue a suspension order; and

(iii) BLM provides you an opportunity for an informal hearing before the BLM State Director to object to a suspension.

(2) BLM may order an immediate, temporary suspension of all or any part of your operations without issuing a noncompliance order, notifying you in advance, or providing you an opportunity for an informal hearing if--

(i) You do not comply with any provision of your notice, plan of operations, or this subpart; and

(ii) An immediate, temporary suspension is necessary to protect health, safety, or the environment from imminent danger or harm. BLM may presume that an immediate suspension is necessary if you conduct plan-level operations without an approved plan of operations or conduct operations other than casual use without submitting a complete notice.

(3) BLM will terminate a suspension order under paragraph (b)(1) or (b)(2) of this section no later than the date by which you correct the violation.

(c) Contents of enforcement orders. Enforcement orders will specify--

(1) How you are failing or have failed to comply with the requirements of this subpart;

(2) The portions of your operations, if any, that you must cease or suspend;

(3) The actions you must take to correct the noncompliance and the time, not exceed 30 days, within which you must start corrective action; and

(4) The time within which you must complete corrective action.

§3809.602 Can BLM revoke my plan of operations or nullify my notice?

(a) BLM may revoke your plan of operations or nullify your notice upon finding that--

(1) A violation exists of any provision of your notice, plan of operation, or this subpart, and you have failed to correct the violation within the time specified in the enforcement order issued under §3809.601; or

(2) a pattern of violations exists at your operations.

(b) The finding is not effective until BLM notifies you of its intent to revoke your plan or nullify your notice, and BLM provides you an opportunity for an informal hearing before the BLM State Director.

(c) If BLM nullifies your notice or revokes your plan of operations, you must not conduct operations on the public lands in the project area, except for reclamation and other measures specified by BLM.

§3809.603 How does BLM serve me with an enforcement action?

(a) BLM will serve a noncompliance order, a notification of intent to issue a suspension order, a suspension order, or other enforcement order on the person to whom it is directed or his or her designated agent, either by--

(1) Offering a copy at the project area to the designated agent or to the individual who, based upon reasonable inquiry, appears to be in charge. If no such individual can be located at the project area, BLM may offer a copy to any individual at the project area who appears to be an employee or agent of the person to whom the notification or order is issued. Service is complete

when the notice or order is offered and is not incomplete because of refusal to accept; or

(2) Sending a copy of the notification or order by certified mail or by hand to the operator or his or her designated agent, or by any means consistent with the rules governing service of a summons and complaint under rule 4 of the Federal Rules of Civil Procedure. Service is complete upon offer of the notification or order or of the certified mail and is not incomplete because of refusal to accept.

(b) BLM may serve a mining claimant in the same manner an operator is served under paragraph (a)(2) of this section.

(c) The mining claimant or operator may designate an agent for service of notifications and orders. You must provide the designation in writing to the local BLM field office having jurisdiction over the lands involved.

§3809.604 What happens if I do not comply with a BLM order?

(a) If you do not comply with a BLM order issued under §§3809.601 or 3809.602, the Department of the Interior may request the United States Attorney to institute a civil action in United States District Court for an injunction or order to enforce its order, prevent you from conducting operations on the public lands in violation of this subpart, and collect damages resulting from unlawful acts. This relief may be in addition to the enforcement actions described in §§3809.601 and 3809.602 and the penalties described in §§3809.700 and 3809.702.

(b) If you fail to timely comply with a noncompliance order issued under §3809.601(a), and remain in noncompliance, BLM may order you to submit plans of operations under §3809.401 for current and future notice-level operations.

PENALTIES

§3809.700 What criminal penalties apply to violations of this subpart?

The criminal penalties established by statute for individuals and organizations are as follows:

(a) Individuals. If you knowingly and willfully violate the requirements of this subpart, you may be subject to arrest and trial under section 303(a) of FLPMA (43 U.S.C. 1733(a)). If you are convicted, you will be subject to a fine of not more than $100,000 or the alternative fine provided for in the applicable provisions of 18 U.S.C. 3571, or imprisonment not to exceed 12 months, or both, for each offense; and

(b) Organizations. If an organization or corporation knowingly or willfully violates the requirements of this subpart, it is subject to trial and, if convicted, will be subject to a fine of not more than $200,000, or the alternative fine provided for in the applicable provisions of 18 U.S.C.

3571.

§3809.701 What happens if I make false statements to BLM?

Under statute (18 U.S.C. 1001), you are subject to arrest and trial before a United States District Court if, in any matter under this subpart, you knowingly and willfully falsify, conceal, or cover up by any trick, scheme, or device a material fact, or make any false, fictitious, or fraudulent statements or representations, or make or use any false writings or document knowing the same to contain any false, fictitious, or fraudulent statement or entry. If you are convicted, you will be fined not more than $250,000 or the alternative fine provided for in the applicable provisions of 18 U.S.C. 3571, or imprisoned not more than 5 years, or both.

§3809.702 What civil penalties apply to violations of this subpart?

(a)(1) Following issuance of an order under §3809.601, BLM may assess a proposed civil penalty of up to $5,000 for each violation against you if you --

(i) Violate any term or condition of a plan of operations or fail to conform with operations described in your notice;

(ii) Violate any provision of this subpart; or

(iii) Fail to comply with an order issued under §3809.601.

(2) BLM may consider each day of continuing violation a separate violation for purposes of penalty assessments.

(3) In determining the amount of the penalty, BLM must consider your history of previous violations at the particular mining operation; the seriousness of the violation, including any irreparable harm to the environment and any hazard to the health or safety of the public; whether you were negligent; and your demonstrated good faith in attempting to achieve rapid compliance after notification of the violation.

(4) If you are a small entity, BLM will, under appropriate circumstances including those described in paragraph (a)(3) of this section, consider reducing or waiving a civil penalty and may consider ability to pay in determining a penalty assessment.

(b) A final administrative assessment of a civil penalty occurs only after BLM has notified you of the assessment and given you opportunity to request within 30 days a hearing by the Office of Hearings and Appeals. BLM may extend the time to request a hearing during settlement discussions. The Office of Hearings and Appeals will issue a penalty assessment that is final.

(c) If BLM issues you a proposed civil penalty and you fail to request a hearing as provided in paragraph (b), the proposed assessment becomes a final order of the Department, and the penalty assessed becomes due upon expiration of the time allowed to request a hearing.

§3809.703 Can BLM settle a proposed civil penalty?

Yes. BLM may negotiate a settlement of civil penalties, in which case BLM will prepare a settlement agreement. The BLM State Director or his or her designee must sign the agreement.

APPEALS

§3809.800 What appeal rights do I have?

(a) Any person adversely affected by a decision made under this subpart may appeal the decision under parts 4 and 1840 of this title. Review of a decision by the BLM State Director will take place if consistent with part 1840 of this title.

(b) In order for the Department of the Interior to consider your appeal of a decision, you must file a notice of appeal in writing with the BLM office where the decision was made within 30 days after the date you received the decision. All decisions under this subpart go into effect immediately and remain in effect while appeals are pending unless a stay is granted under §4.21(b) of this title.

(c) Your written appeal must contain:

(1) Your name and address; and

(2) The BLM serial number of the notice or plan of operations that is the subject of the appeal.

(d) You must submit a statement of your reasons for the appeal and any arguments you wish to present that would justify reversal or modification of the decision within the time frame specified in part 4 of this chapter (usually within 30 days after filing your appeal).

APPENDIX C
OTHER APPLICABLE REQUIREMENTS

The following is a list and brief description of major laws, regulations, executive orders, permits, licenses, and reviews that could apply to mineral projects on public lands. This is not intended to be an exhaustive list, and other requirements may apply at the local, county, or state level. Some of the procedural requirements depend upon whether there is an underlying federal action or decision and may not apply under some alternatives, such as Alternative 2, where there is not a BLM decision on specific exploration or mining projects.

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GENERAL REQUIREMENTS

The following acts and executive order establish general review requirements or management objectives that apply to mineral projects on public lands.

Federal Land Policy and Management Act of 1976 (FLPMA), P.L. 94-579. Section 302(b) states that "In managing the public lands the Secretary shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands."

Executive Order 12088 - Federal Compliance with Pollution Control Standards, October 13, 1978. Executive Order 12088 directs executive agencies to take all necessary actions to prevent, control, and abate environmental pollution from activities and facilities under their control. This order further directs those agencies to comply, to the same extent as any other person is required to do so, with both the procedural and substantive requirements of pollution control standards, including the Resource Conservation and Recovery Act; Comprehensive Environmental Response, Compensation, and Liability Act; Clean Water Act; Safe Drinking Water Act; and state and local laws and rules.

National Environmental Policy Act of 1969 (NEPA), P.L. 91-190. The National Environmental Policy Act directs federal agencies to consider the environmental impact of their decisions. NEPA requires BLM to prepare environmental assessments or environmental impact statements for the approval of Plans of Operations. Some states, such as Montana and California, have state laws similar to NEPA.

The 1970 Mining and Mineral Policy Act and **The 1980 Natural Materials and Minerals Policy, Research, and Development Act.** Both of these acts direct that the public lands be managed in a manner that recognizes the Nation's need for a domestic source of mineral production.

AIR QUALITY

The federal statutes pertaining to air quality protection are contained in the following acts.

Clean Air Act (CAA), P.L. 84-159 (Air Pollution Control Act; July 14, 1955), 42 USC 7401 et seq., as amended numerous times.

The objectives of the Clean Air Act are (1) to protect and enhance the quality of the Nation's air resources so as to promote the public health, welfare, and productive capacity of its people, (2) to initiate and accelerate a national research and development program to prevent and control air pollution, (3) to provide technical and financial assistance to state and local governments for developing and executing air pollution prevention and control programs, and (4) to encourage and assist the development and operation of regional air pollution prevention and control programs.

The U.S. Environmental Protection Agency (EPA) is responsible for developing standards, rules, guidance, and program oversight. The states have the primary responsibility for enforcing air quality regulations and standards as defined in an EPA-approved "state implementation plan," and may establish more stringent regulations and standards. These responsibilities may be further delegated to local authorities. Tribal governments are responsible for enforcing standards on their lands, based on EPA-approved "tribal implementation plans." BLM is responsible for assuring that all of its activities (either directly or through use authorizations) comply with all local, state, and federal air quality laws, regulations, and standards.

Specifically, under Section 118 of the Clean Air Act, BLM "(1) having jurisdiction over any property or facility, or (2) engaged in any activity ... which may result in the discharge of air pollutants," and each employee "shall be subject to, and comply with, all Federal, State, interstate, and local [air quality] requirements." These regulations apply to any action (whether substantive or procedural), to requirements to pay fees, to the exercise of any administrative authority, and to any process or sanction. In addition, these requirements apply "not withstanding any immunity of such agencies, officers, agents, or employees under any rule of law."

In addition, under Section 176, BLM "shall not engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an implementation plan..." Further, "The assurance of conformity to such an implementation plan shall be the affirmative responsibility of the head of such department, agency, or instrumentality." In essence, BLM must demonstrate that every decision or action it takes will comply with air quality requirements.

Federal Land Policy and Management Act of 1976 (FLPMA), P.L. 94-579 (October 21, 1976), 43 USC 1701 et seq., as amended.

An Act; "to establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development, and enhancement of the public land; and for other purposes."

Through the Secretary of the Interior, BLM is responsible for implementing FLPMA. As an "organic" act, FLPMA defines BLM's organization and provides the basic policy guidance for management of the Public Lands. Therefore, FLPMA is the primary law guiding all BLM activities; BLM should implement other legislation in a manner that conforms to FLPMA and its overall intent.

As stated in Section 102: "The Congress declares that it is the policy of the United States that ... the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use ..."

Land use plans (Section 202), which describe how the BLM will manage the public lands, must "... provide for compliance with applicable pollution control laws, including State and Federal air, water, noise, or other pollution standards or implementation plans ..."

A provision for revoking or suspending land use, occupancy, or development authorizations upon "a finding of a violation of ... applicable State of Federal air or water quality standard or implementation plan ..." is required under Section 302.

Finally, under Section 505, "each right-of-way [provision] shall ... require compliance with applicable air and water quality standards established by ... Federal or State law ..."

HAZARDOUS MATERIALS AND WASTE MANAGEMENT

Resource Conservation and Recovery Act (RCRA), P.L. 94-580, as amended by the Solid Waste Disposal Act Amendments of 1980, P.L. 96-482, USC 6901 et seq. The Resource Conservation and Recovery Act (RCRA) is the federal law governing management of solid and hazardous waste. RCRA divides wastes on two regulatory tracks: Subtitle D (solid waste) and Subtitle C (hazardous waste). In October 1980 Congress amended RCRA by adding Section 3001(b)(3)(A)(iii) (known as the Bevill exclusion or amendment) for solid waste from the extraction, beneficiation, and processing of ores and minerals. The Bevill amendment excluded such mining waste from regulation as hazardous waste under Subtitle C of RCRA, pending completion of a study and report to Congress. All extraction and beneficiation wastes and 20 special mineral processing wastes are excluded from RCRA Subtitle C regulation by virtue of the Bevill amendment (see 40 CFR 261.4(b)(7)).

RCRA emphasizes the primary role of the states in managing both conventional solid wastes and hazardous wastes. The legislation provided a federal support role with minimal enforcement and regulatory process for conventional solid wastes. Actual regulation and enforcement of solid-nonhazardous wastes was left to the states, which were to follow broad guidelines established at the federal level.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 42 USC 9601 *et seq.*; as amended by Superfund Amendments and Reauthorization Act (SARA), P. L. 99-499, October 17, 1986. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the amendment of the Superfund Amendments and Reauthorization Act (SARA) authorized response to releases or threatened releases of hazardous substances that may endanger public health, welfare, or the environment. The law outlines the procedures for reporting any environmental releases of a hazardous substance that exceeds a reportable quantity and also incudes provisions for permanent cleanups, known as remedial actions, and other cleanups referred to as removals. SARA created the Emergency Planning and Community Right-to-Know Act (EPCRA), a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by state and local governments.

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Uranium Mill Tailings Remediation and Control Act of 1978 (UMTRCA), P.L. 95-604, Nov. 8, 1978; 92 stat. 3021; as amended by P.L. 95-106 , Nov. 9, 1979, 93 stat. 799; and P.L. 97-415, January 4, 1983, 96 stat. 2078. The Uranium Mill Tailings Radiation Control Act (UMTRCA) regulates mill tailings at active and inactive uranium mills that present a hazard to public health. The act provides that efforts must be made to stabilize, control, and dispose of uranium mill tailings in an environmentally sound and safe manner. UMTRCA provides (1) a program of assessment and remedial action at abandoned mill sites and (2) a program regulating mill tailings during processing at active processing mills.

WATER RESOURCES

Clean Water Act (CWA), P.L. 92-500, as amended by P.L. 95-217, P.L. 95-576, P.L. 96-483, and P.L. 97-117; 33 USC 125. et seg. The objectives of the Clean Water Act are to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The act protects surface "navigable" water through federally enforceable regulations, with emphasis on discharge of pollutants to surface waters.

Regulations for protecting ground water are not specifically included in the Clean Water Act. Authority to protect ground water is vested in the states. But the Clean Water Act clearly delineates the federal role in protecting ground water quality. Section 313 requires federal compliance with valid state and local government requirements to the same extent as any nongovernmental entity. Sections 208 and 106 provide the federal financial assistance and guidance to state and local governments for planning and managing ground water resources. Section 208b.2 requires that individual states develop processes to identify and control the following:

> Surface mining and underground mining-associated pollution of surface water and ground water.
>
> Intrusion of salt water into fresh ground water aquifers.
>
> The disposition of residual wastes that could degrade the quality of surface or ground water.
>
> The disposal of pollutants on land or in excavations wherein adjacent surface water or ground water quality degradation could ultimately result.

The Clean Water Act also regulates dredge and fill placement in waters of the United States. A permit under Section 404 of the act is required for mining that would disturb wetlands or other waters of the United States. This permitting program is administered by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency.

Safe Drinking Water Act (SDWA), P.L. 93-523, as amended by P.L. 95-190, 42 USC 300 et seg. In 1974 Congress passed the Safe Drinking Water Act, part C of which directed the Environmental Protection Agency to establish minimum requirements for effective state programs to prevent underground injection that endangers ground water resources of public supply systems. This program became known as the Underground Injection Control Program (UIC).

Under the Underground Injection Control Program injection wells are divided into five well classes for the purpose of regulations. Class III wells are used to inject fluids for the recovery of minerals such as solution mining of salts and sulfur and in-situ leaching of uranium, copper, or (experimentally so far) gold. Class V wells and for a while some class I wells have mining application for the disposal of hazardous or nonhazardous waste, including the use of mine wastes to backfill underground mines.

The purpose of the Safe Drinking Water Act is to protect the public health and welfare by assuring that the quality of drinking water provided by public water systems is adequate for human use. To meet this goal, the act provides for the following:

> Establishing primary national drinking water regulations setting forth mandatory maximum contaminant levels in drinking water supplied by public water systems.
>
> Establishing secondary national drinking water regulations for public water systems. These regulations are not mandatory, but they are recommended standards to protect public health.
>
> Protecting the quality of aquifers that serve as the main source of drinking water for an area and that, if contaminated, would create a significant public health hazard.
>
> Protecting underground sources of drinking water from injection of pollutants.

The Safe Drinking Water Act provides for and encourages delegation of its authorities to the states, which assume primary responsibility for enforcing its provisions. Only if a state fails to assume the responsibility would EPA assume enforcement responsibility.

Under the provisions of Section 1447(a) of the act, BLM is required to comply with both the substantive and procedural requirements of the act. Specifically, Section 1447 directs that

> (a) Each federal agency (1) having jurisdiction over any federally owned or maintained public water system or (2) engaged in any activity that results in or may result in underground injection that endangers drinking water (within the meaning of Section 1421(d)(2)) is subject to and must comply with all federal, state, and local requirements; administrative authorities; and processes and sanctions respecting the provision of safe drinking water and respecting any underground injection program in the same manner, and to the same extent, as any nongovernmental entity.

Under the provisions of the act, BLM therefore is not responsible for primary enforcement of the act's requirements but rather is regulated by those provisions. BLM's role is to help the states in their efforts to protect the quality of ground water that has present or potential use as an underground source of drinking water.

Wild and Scenic Rivers Act, P.L. 90-548, Oct. 2, 1968, 82 stat. 906 and as amended. Portions of this act provide for-control of activities that are on land next to rivers and could cause or contribute to pollution of waters, or could degrade water quality through erosion and siltation of riverbank lands, and contamination of ground water sources feeding the river.

Executive Order 11990, Protection of Wetlands, May 24, 1977, 44 FR 1955. Executive Order 11990 directs all agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands according to the National Environmental Policy Act. The order covers aspects of federal activities affecting wetlands, including land management, facilities development, and licensing regulations. Agencies are asked to minimize the impacts of federal actions on wetlands and their related beneficial effects, such as ground water recharge. In carrying out any activities affecting wetlands, federal agencies must consider such factors as public health, safety, and, welfare, including such things as water supply and quality, recharge, and discharge areas for ground water, pollution, etc.

CULTURAL RESOURCES

Antiquities Act of 1906, P.L. 59-209. The Antiquities Act provides for protecting archaeological resources on federal lands through criminal sanctions against excavation, injury, or destruction of archaeological sites without permission. This legislation has been declared unconstitutionally vague in the Ninth Circuit and is no longer enforced.

National Historic Preservation Act of 1966, P.L. 89-665, as amended by P.L. 94-422, P.L. 94-458, and P.L. 96-515. The National Historic Preservation Act (NHPA) is the basic federal mandate for managing and protecting historic properties. Section 106 requires federal agencies to account for the effects of their actions on historic properties on public and private lands and allows the public, the State Historic Preservation Officer, and the President's Advisory Council on Historic Preservation to comment on federal undertakings before authorization. Section 110 requires agencies to systematically inventory all lands for historic properties and protect them through active management. Section 106 compliance has dominated the program. Amendments enacted in 1992 direct agencies to account for the effects of proposed activities on traditional cultural properties of American Indians, ranching communities, and other traditional lifeways. This law is implemented at 36 CFR 800, which is being revised in response to the 1992 amendment. The National Register aspects of the National Historic Preservation Act are implemented at 36 CFR 60, 63, and 68. BLM Manuals 8111 - *Cultural Resources Inventory and Evaluation (Upland)*, 8141 - *Physical and Administrative Protection Measures*, and 8143 - *Procedures for the Avoidance or Mitigation of Effects on Cultural Resources* further implement the National Historic Preservation Act.

Archaeological Resources Protection Act of 1979 (ARPA) (P.L. 96-96). The Archaeological Resources Protection Act (ARPA) requires a permit for any excavation or removal of archaeological resources from public lands and provides civil and criminal penalties for violating permit requirements. Given these penalties, ARPA is the basis for most prosecutions and suits involving archaeological resources and provides the mandate for the Cultural Resources Use

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Permit System, as well as archaeological resource interpretive and education programs. ARPA requires the systematic inventory of all federal lands to locate and protect archaeological resources. ARPA is implemented at 36 CFR 296: 43 CFR 3 and 7 and in BLM Manual 8151 - *Cultural Resource Use Permits.*

Executive Order 11593. This order supplements the National Historic Preservation Act and Archaeological Resources Protection Act by directing federal agencies to locate and inventory all cultural resources under their jurisdiction and to ensure that actions do not affect significant cultural resources. It also directs agencies to consider the effects of their actions on nonfederal lands.

AMERICAN INDIAN RESOURCES, CONSULTATION, AND COORDINATION

Executive Order 13084. This order, signed May 14, 1998, requires "regular and meaningful consultation and collaboration with Indian tribal governments in the development of regulatory practices on Federal matters that significantly or uniquely affect their communities; to reduce the imposition of unfunded mandates upon Indian tribal governments; and to streamline the application process for and increase the availability of waivers to Indian tribal governments."

The American Indian Religious Freedom Act of 1978, P.L. 95-341, and Executive Order 13007. Both of these require federal agencies to evaluate their policies and procedures to protect the religious freedom of American Indians. In American Indian religious practice any area can contain places that are significant for sacred practices or purposes. Those sacred places embodying spiritual values may have specific land forms, indigenous rock art, medicine wheels, rock cairns and effigy figures, spirit trails and spirit gates, caves, springs and lakes, Indian graves, and contemporary use areas. Although the act has no implementing regulations, it is of great political and cultural significance to American Indians. The act requires consultation with American Indians and consideration of an action's potential affects on religious practices and access to areas of religious importance.

Native American Graves Protection and Repatriation Act (P.L. 101-106). The Native American Graves Protection and Repatriation Act pertains specifically to American Indian human remains, funerary items, sacred objects, and items of cultural patrimony removed from public lands. This law has two elements. The first vests ownership of Native American Graves Protection and Repatriation Act items with American Indians and requires agencies to consult with American Indians to repatriate them. The second requires ongoing consultation and coordination with American Indians about discoveries of Native American Graves Protection and Repatriation Act items during activities on public lands. BLM is consulting with American Indians on a project-specific basis and is working with tribal governments to draft memoranda of understanding dealing programmatically with discoveries. Native American Graves Protection and Repatriation Act regulations are now being written. BLM Manual 8161 and its consultation handbook give guidance for BLM consultation.

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Executive Order 94-3175. This order directs federal agencies to deal with American Indian tribal governments on a government-to-government basis and to pay special attention to federal Indian trust responsibilities. Since this is a new order, no specific implementing policies are in place, and this order's implications for land management are being worked out in the field.

CAVE RESOURCES

The Federal Cave Resources Protection Act of 1988 (FCRPA). The Federal Cave Resources Protection Act provides for the designation of significance based upon six criteria: biota, cultural, geologic/mineralogic/paleontologic, hydrologic, recreational, and educational or scientific values. Upon discovery, a cave is evaluated to determine its significance. If a cave is determined to be significant, its entire extent, including passages not mapped or discovered at the time of determination, is deemed significant.

WILDLIFE RESOURCES

Although a variety of laws, regulations, policies, and programs relate to wildlife, the following have a major affect on the protection of wildlife resources in relation to mining.

The Endangered Species Act, P.L. 93-205 (1973), P.L. 94-359 (1974), P.L. 95-212 (1977), P.L. 95-632 (1978), P.L. 96-159 (1979), P.L. 97-304 (1982), P.L. 100-653 (1988). The purpose of this act is to identify and conserve species that are threatened or endangered with extinction. The act prohibits the taking of species listed as threatened or endangered, either directly or indirectly through habitat loss or modification. This prohibition applies to all activities regardless of land ownership.

Migratory Bird Treaty Act, P.L. 86-732 (1960). This act is an international treaty that prohibits the taking of any migratory bird without permit or authorization. This prohibition applies to situations where, for example, migratory waterfowl land on a tailings pond or process solution pond that contains toxic levels of contaminants. Any resulting wildlife deaths would be (and have been) violations of the Migratory Bird Treaty Act. This prohibition applies to all activities regardless of land ownership.

Executive Order 11987, Exotic Organisms, June 8, 1977. Executive Order 11987 directs all agencies to restrict the introducing of exotic species into natural ecosystems on land and waters that they own, lease, or hold for purposes of administration. This order also encourages states, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the United States.

Wild Free-Roaming Horses and Burros Act of 1971, P.L. 92-195, as amended by P.L. 94-579 (1976) and P.L. 95-514 (1978). This act protects wild free-roaming horses and burros, directing BLM and the Forest Service to manage such animals on public lands under their jurisdiction.

Bald Eagle Act of 1940, as amended by P.L. 92-535 (1972). This act protects the bald eagle and golden eagle by prohibiting except under certain specified conditions the taking, possession, and commerce of such birds.

SPECIAL STATUS AREAS

Wilderness Act (16 U.S.C. 1131-1136) § 1133. Use of wilderness areas 43 CFR Ch. II Subpart 8560-(b) ... wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use. The objective of these regulations is to manage the public lands designated as part of the National Wilderness Preservation System to preserve and protect their wilderness character, provide for their use and enjoyment by the American people in a manner that will leave them unimpaired for future use and enjoyment as wilderness, and allow for recreational, scenic, scientific, educational, conservation, and historical use. Subpart 8560.4-6 describes mining law administration in wilderness areas. These regulations require that mineral operations be conducted to maintain the wilderness character unimpaired consistent with the use of the land for mineral activities and that all facilities must be removed within 1 year after operations cease. This section also requires that validity examinations be conducted before allowing mining operations in wilderness areas to determine if valid existing rights were present as of the date of withdrawal.

Research Natural Areas, 43 CFR Subpart 8223. No person shall use, occupy, construct, or maintain facilities in a research natural area except as permitted by law, other federal regulations, or authorized under provisions of this subpart 8223.

(b) No person shall use, occupy, construct, or maintain facilities in a manner inconsistent with the purpose of the research natural area.

(c) Scientists and educators shall use the area in a manner that is nondestructive and consistent with the purpose of the research natural area.

APPENDIX D
SUMMARY OF STATE MINING REGULATIONS/PROGRAMS

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ALASKA

Locatable mineral activities on BLM lands in Alaska are regulated by the Department of Natural Resources (DNR) according to Section AS 27.19.010 of the Alaska State Code. This regulation is accomplished through a variety of state regulatory programs and permits that apply to reclamation and clean water requirements for mineral activities on state, private, and federal lands.

Plan Threshold and Submission Requirements

Alaska has no "casual use" exemption, nor does it require a permit for disturbances of less than 5 acres. Notification for these operations is similar to BLM requirements. The use of suction dredges with intake diameters of 6 inches or less is exempt from regulation. Information for Notice- and Plan-level operations is submitted to DNR and BLM using the Annual Placer Mining Application (APMA). DNR in turn notifies all other involved agencies—Fish and Game, Army Corps of Engineers, etc. This notification simplifies the permitting process because the involved agencies are informed by the state, and miners do not have to do the work on their own. In accepting this form, BLM has reserved the right to request more information from the claimant or operator for the NEPA evaluation.

The Alaska definition of "project area" does not include roads and camp areas.

Performance Standards

Alaska has site-specific standards for surface water resources as well as operational and reclamation standards. The Alaska Department of Environmental Conservation (DEC) sets ground water requirements on a site-specific basis. These requirements usually consist of standards set by EPA. DEC conducts monitoring. Variances can be granted on a site-specific basis. The state has topsoil and backfilling standards. Revegetation requirements are general, including stabilization of the site that allows for reestablishing the renewable resources on the site within a reasonable period of time by natural processes. The technology-based operational standards used are "best management practices" (BMP).

Alaska requirements governing cyanide operations or acid rock drainage are handled by DEC. The state has the authority to regulate all chemical applications used in mining.

Resource Protection Standards

Alaska does not have a specific statutory provision to protect threatened and endangered species, although Title 16 applies to fish and wildlife. Alaska has no specific regulation of caves and cave resources but offers statutory protection to both historical (National Historic Preservation Act) and archaeological and paleontological resources.

Alaska has no state National Environmental Policy Act (NEPA) law or process. Alaska uses a "large mine project process" for obtaining public input in reviewing significant mines. No special provisions apply to consultation with American Indian governments.

Enforcement, Shut Down, and Bonding

The staff of the Alaska DNR Division of Mining consists of five people, including two inspectors. Operations are inspected when convenient or needed. There is no fixed schedule. The state handles bonding for BLM. Regulations for shut-down operations are similar to those proposed by BLM. Administrative actions are first used against an operator or claimant to remedy a noncompliance. When administrative actions fail, money for reclamation is acquired from the statewide bond pool. The state then pursues the operator or claimant in civil court to recover money spent on reclamation and administrative costs. Alaska statues define no specific criminal or civil penalties for mining.

Significant Differences

Substantive regulatory differences between the Alaska State Program and the existing 3809 regulations are in two areas: (1) Operations using 6-inch or smaller intake diameters are exempted from filing a Notice-type documents for suction dredging, and (2) no regulations provide for the specific control of acid rock drainage and cyanide operations.

ARIZONA

Currently Arizona State Mined Land Reclamation Rules apply only to private land. The Arizona Department of Environmental Quality issues an Aquifer Protection Permit. The Arizona Department of Water Resources issues permits for drilling if certain conditions are met. And state and local governments issue other permits. While other federal, state, and local permits are required for exploration and mining, BLM takes the lead for the lands it manages. No broad state permit applies. In addition, a "mining summit" has been established in Arizona with most federal, state, and local regulators and industry representatives participating. Its purpose is to develop a process for industry and regulators to communicate, coordinate, and facilitate a more efficient permitting process. This process is now in the development stage.

Plan Threshold and Submission Requirements

While there is no "casual use" exemption as such, Arizona does not require a permit for disturbances under 5 acres. Notification for these operations is similar to BLM requirements. No state criteria exist for suction dredge thresholds.

Arizona's information requirements for Plans and Notices are functionally equivalent to BLM's. The Arizona term for a project area is "mining facility." The definition of mining facility appears consistent with the definition of "project area" in both the existing and proposed regulations. But the State Mined Land Reclamation Rules apply only to private land.

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Performance Standards

The State Department of Environmental Quality has a monitoring program as part of its Aquifer Protection Permit. The monitoring program applies to both surface and ground water.

The standards require the use of the "best available demonstrated control technology" (BADCT). resources as well as operational and reclamation standards. The state has standards for ground water and water quality monitoring under its Aquifer Protection Permit. There are no standards for backfilling. The Aquifer Protection Permit has revegetation requirements, but Arizona BLM's opinion is that BLM should establish revegetation standards for postmining use. The Mining Summit may resolve perceived conflicts. The State Mined Land Reclamation Rules have topsoil and revegetation requirements, but the state rules do not apply to BLM-managed land. The State Mined Land Reclamation Rules allow for variances from an approved reclamation plan if the variance will not endanger public safety and will not be inconsistent with the law. The state rules apply only to private land.

The Arizona Department of Environmental Quality regulates acid-forming rock and leaching facilities under its Aquifer Protection Permit. Arizona BLM is unaware of any state-established inspection frequencies for operations using cyanide or other leachates. Currently Arizona BLM accepts the Department of Environmental Quality standards in the absence of a showing that state standards will result in unnecessary or undue degradation.

Resource Protection Standards

The Arizona Department of Agriculture protects listed plant species, and the Arizona Department of Game and Fish protects listed animal species.

Arizona has authority to protect cave resources. There are provisions for environmental review and public participation of submissions to the Arizona State Mine Inspector, Arizona Department of Environmental Quality.

Arizona protects state lands in conformance with both the National Historic Preservation Act and the Archaeological Resources Protection Act, and burial sites for all lands within the state.

Enforcement, Shut Down, and Bonding

The state handles bonding for reclamation and mine closure. Bond criteria range from accepting a statement of financial capability to posting the required bond. Arizona does not require consultation with American Indian governments.

The state rules provide for a fine not to exceed $1,000 per day and not to exceed $15,000. The penalty for unreclaimed, shut-down operations is forfeiture of the reclamation bond. As previously stated, the state rules apply only to private land.

Significant Differences

Arizona and BLM have similar review and public involvement processes and rules for controlling cyanide or other leachate and acid rock drainage. But state rules apply only to private land, and the federal, state, and local regulators have yet to establish firm policies for joint review of permit applications. These policies and agreements are under development.

CALIFORNIA

Mining activities, including locatable mineral activities (3809) on BLM-administered lands are regulated by several California state laws. A short summary of the important California regulations for mining are outlined in the following paragraphs.

Surface Mining and Reclamation Act (SMARA) is based on the Public Resource Code, Division 2, Chapter 9, Section 2710 et seq. This act establishes procedures and standards that affect reclamation and the conduct of surface mining on private, federal, and state lands. The enforcement of SMARA is delegated to a lead agency, usually the county. (It could also be a city.) Additionally, the county can write its own ordinances that exceed the reclamation standards in SMARA.

California Environmental Quality Act (CEQA) is the California counterpart to the National Environmental Policy Act. CEQA requires California state and local agencies to determine the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.

Porter-Cologne Water Quality Control Act is based on the Water Code 13000 et seq. and regulates the discharge of waste that could affect state waters subject to waste discharge requirements (WDR). One of six Regional Water Quality Control Boards (RWQCB) reviews a mining proposal, holds public meetings, and requires a separate reclamation bond.

Fish and Game, Code Section 5650 makes it illegal to permit the passage of any substance deleterious to fish, plants, or bird life to the waters of the state, unless authorized by regional board waste discharge requirements or a federal permit for which Clean Water Act, Section 401 state certification is issued.

California Endangered Species Act, Fish and Game Code 2050 et seq., makes it illegal to "take" state-listed endangered, threatened, or candidate species, except as authorized by California Department of Fish and Game.

Plan Threshold and Submission Requirements

Mining operations that disturb less than 1 acre or remove less than 1,000 cubic yards of material are exempt from the SMARA regulations. California has no state equivalent to the 3809 definitions of casual use or Notice-level mining activity. Plans are required for all cyanide operations regardless of size. California's information requirements for permitting are generally more stringent than BLM's. California's suction dredging regulations do not conflict with BLM's. The California definition of project area does not include areas outside the mining facility.

Performance Standards

The Surface Mining and Reclamation Act (SMARA) contains detailed performance standards for mining within the state. The SMARA regulations (revised 1/97) are listed at code 3700, article 9, on page 22. The code includes the following:

3701. Definitions
3702. Financial Assurances
3703. Performance Standards for Wildlife Habitat.
3704. Performance Standards for Backfilling, Regrading, Slope Stability, and Recontouring.
3705. Performance Standards for Revegetation
3706. Performance Standards for Drainage, Diversion Structures, Waterways, and Erosion Control.
3707. Performance Standards for Prime Agricultural Land Reclamation.
3708. Performance Standards for Other Agricultural Land.
3709. Performance Standards for Building, Structures, and Equipment Removal.
3710. Performance Standards for Stream Protection, Including Surface and Groundwater.
3711. Performance Standards for Topsoil Salvage, Maintenance, and Redistribution.
3712. Performance Standards for Tailings and Mine Waste Management.
3713. Performance Standards for Closure of Surface Openings.

Resource Protection Standards

California Endangered Species Act (Fish and Game Code 2050 et seq) makes it illegal to "take" a state-listed endangered, threatened, or candidate species except as authorized by the California Department of Fish and Game. The taking can lead to a misdemeanor prosecution, fines, and incarceration.

The State Historic Preservation Office (SHPO) agency regulates historical, cultural, and archaeological sites.

Enforcement, Shut Down, and Bonding

Under the SMARA regulations, enforcement, inspection, and bonding are decentralized to the 58 counties in California. Some of the more populated counties have full-time inspectors, but rural counties usually assign this task to the county planning or engineering department. Because of a lack of funding and trained technical people, some counties have ignored mining on federal lands and concentrated their efforts on private property.

Significant Differences

Substantive regulatory differences between the California state program and the existing 3809 regulations include the following:

1. The allowance for disturbance under 1,000 cubic yards per acre requires no Plan (casual use).

2. California has more stringent data requirements for mining plans.

3. California has no Notice-level operations; an operation requires a mining plan or is "casual use" per 3809.

4. Mandatory Regional Water Control Board reclamation bond can't be jointly held with any other agency, including BLM.

5. Counties charge mining proponents financial fees to review mine plans (actual expenses) and conduct mine inspections.

6. Some of the counties (e.g. Mono) have instituted mining ordinances that are careful to avoid zoning laws but onerous on environmental studies. The result is to discourage mining on both private and federal lands.

COLORADO

Locatable mineral activities on BLM lands in Colorado are regulated by the Colorado Mined Land Reclamation Board (CMLRB), based on sections C.R.S. 34-32-101 and C.R.S. 34-32.5-101 of the State Code. This regulation is accomplished through the Division of Minerals and Geology (DMG) administering the CMLRB Hard Rock/Metal Mining Rules and Regulations. The CMLRB regulatory program applies to all hard rock mineral activities on all lands in the state.

Plan Threshold and Submission Requirements

Colorado does not have casual use or Notice thresholds for mining activity. Disturbances involving less than 1,600 square feet are exempt from regulation. Suction dredging is not regulated by DMG; it is presumed to be within the <1,600 sq. ft. exemption. The significant threshold in Colorado regulation is that between prospecting and mining. A notice of intent is required for prospecting, regardless of acreage disturbed. A permit application, and issuance of a Reclamation Permit, is required for all mining activity, regardless of disturbed acreage.

The Colorado information requirements for Plans and Notices are functionally equivalent to BLM's (generally more detailed and comprehensive) except possibly for prospecting involving more than 5 acres. Colorado's definition of project area excludes access, pipelines, and other facilities that lie outside the mine area.

Performance Standards

Colorado has extensive operational and reclamation performance standards but not a concept of best available technology and practices or best management practices. Strict engineering standards have to be met for operations involving cyanide leaching or acid rock drainage. Standards for ground water and surface water are all inclusive. The state conducts or requires water quality monitoring for certain operations, requires backfilling when suitable for site conditions, and has requirements for topsoil, recontouring, and revegetation. Colorado maintains comprehensive testing, control, and monitoring procedures for acid-forming and leaching operations. The state's performance standards are generally more comprehensive than BLM's, especially for operations disturbing less than 5 acres.

Colorado has authority to regulate cyanide and acid rock drainage operations but requires no set inspection schedule.

Resource Protection Standards

Colorado does not have a specific statutory provision to protect threatened and endangered species but does have special protection measures for fish and wildlife. Colorado considers protection to both historical (National Historic Preservation Act) and paleontological resources.

There is no state National Environmental Policy Act (NEPA) law although Colorado Mined Land Reclamation Board hearings provide a process for public involvement. Colorado does not provide specific statutory or regulatory protection under the National Historic Preservation Act or the Archaeological Resources Protection Act, or to caves or cave resources. No special provisions apply to consultation with American Indian governments, but they can request hearings before the Colorado Mined Land Reclamation Board.

Enforcement, Shut Down, and Bonding

The staff of the Colorado Division of Minerals and Geology consists of 18 people, including 15 inspectors. Operations are inspected as needed, depending on the type of operation, resources involved, and operator. The state requires bonding of all operations. Prospecting disturbance is bonded at a minimum of $2,000/acre. Reclamation permits issued for mining require a bond for 100% of expected costs of closure and reclamation Regulations pertaining to shut down operations do not conflict with those proposed by BLM. Operating without a permit, or in violation of the terms of a Notice/Permit results in civil penalties and substantial fines. The Colorado Mined Land Reclamation Board issues cease and desist orders and can seek injunctive relief in state court.

Significant Differences

Substantive regulatory differences between the Colorado state program and the existing 3809 regulations include disturbance of <1,600 ft^2 and suction dredging not being regulated and all prospecting is considered Notice-level activity, regardless of acreage involved. Conversely, all mining is Plan-level activity. Colorado has no set inspection schedule for acid rock drainage and cyanide operations. Colorado requires that prospecting (notices of intent) remain confidential with the Division of Minerals and Geology. The Colorado Mined Land Reclamation Board issues reclamation permits for all mining operations.

IDAHO

Locatable mineral activities on BLM lands in Idaho are regulated by the Idaho Department of Lands, the Department of Water Resources, and the Division of Environmental Quality under Titles, 39, 42, and 47 of the Idaho Code. This regulation is accomplished through a variety of state regulatory programs and permits that apply to mineral activities regardless of land ownership or surface management agency.

Plan Threshold and Submission Requirements

Idaho does not require a permit for suction dredging or placer mining involving less than half an acre, or for underground mining. The use of suction dredges with intake diameters of 8 inches or less is exempt from regulation. Notice-type documentation is required for exploration involving less than 5 acres, but this notification is required only after the fact.

The information required by Idaho for Plans is generally as comprehensive as that required by BLM. For Notices the state requires less detail. The Idaho definition of project area does not conflict with BLM's. It includes "overburden disposal areas, mined areas, mineral stockpiles, roads, tailings ponds, and other areas disturbed at the surface mining operation site."

Performance Standards

Idaho uses best management practices (BMP) operational standards for water resources. There are generally no variances. The state has specific, detailed standards for ground water and for water quality monitoring. Idaho has topsoil and revegetation standards and requires backfilling for mines where the pit is 2 acres or smaller. Where operations disturb 2 acres or more, all waste piles and depressions must be contoured to the lowest practicable grade. Idaho requires testing, control, and monitoring of acid-forming and leaching operations.

Idaho has requirements for governing testing, control, and monitoring of cyanide operations and acid rock drainage but no set schedule for inspections.

Resource Protection Standards

Idaho has statutory protection for threatened and endangered species as well as for fish and wildlife. Idaho has no state National Environmental Policy Act law, although the decision-making process allows for public involvement and review. Idaho does give statutory protection to historical, archaeological, and paleontological resources but not to caves and cave resources. Native American governments are given the opportunity to comment where affected by a proposed operation.

Enforcement, Shut Down, and Bonding

The staff of the Surface Mining Section of the Idaho Department of Lands consists of 10 people, all of whom are involved in field inspections. Operations are inspected on a case-by-case basis, depending on the sensitivity of the resources. The state handles bonding, with maximum bond coverage of $2,500/acre. Regulations for shut-down operations require reclamation after 3 years and do not conflict with BLM's proposed regulations. Civil penalties for noncompliance with the rules or an approved plan provide for a penalty of not less than $500 or more than $2,500 for each day of violation after notice of violation. The Director of the Department of Lands is also authorized to seek injunctive relief against operators.

Significant Differences

The following provisions of the Idaho state program substantially differ from the existing 3809 regulations: suction dredges under 8 inches in diameter are exempt from permitting; no permit is required for underground mining; documentation for Notice-type operations is required within 7 days of the beginning of operations; no set inspections are required for cyanide and acid rock drainage operations; no specific state protection is given to cave resources; $2,500/acre is the ceiling for bond amounts.

MONTANA

Locatable mineral activities on BLM lands in Montana are regulated by the Montana Department of Environmental Quality (DEQ), Environmental Management Bureau, through a variety of state regulatory programs and permits that apply to mineral activities regardless of land ownership or surface managing agency.

Plan Threshold and Submission Requirements

Montana does not have casual use or Notice thresholds, but the Department of Environmental Quality issues three types of permits under the Montana Metal Mine Reclamation Act (MMRA): an exploration license, a small miner exclusion statement (SMES), and operating permits. Mining of bentonite is covered under the Open Cut Act.

Under the Montana Metal Mine Reclamation Act an exploration license is required for any mechanized exploration, regardless of amount of land involved, including for road building and drilling, trenching, or construction of exploration adits or shafts.

Small-mine operators who disturb less than 5 acres and are not using chemical processing or engaging in placer mining may obtain a small miner exclusion statement.

An operating permit is required for all placer mines, mines using chemical processing, or mines disturbing more than 5 acres. General requirements include mine plans, processing plans, reclamation plans, monitoring plans, rock characterization and handling plans, and environmental baseline data (especially for water).

Performance Standards

All exploration disturbance must be reclaimed.

The small miner exclusion statement (SMES) exempts hardrock operators from performing reclamation. Nevertheless, the SMES operator still must comply with state water quality laws. Suction dredge operators must obtain a 310 permit from the county conservation district, regardless of suction dredge size.

Operating permit requirements vary by size, type, location, and complexity of the project issues. All disturbed lands must be reclaimed to achieve comparable stability and utility to adjacent undisturbed lands. Montana does not automatically require mine pit backfilling, but backfilling is considered during application review and environmental analysis. Areas not backfilled must be mitigated to limit impacts as described in the Montana Metal Mine Reclamation Act.

Under the Open Cut Act, bentonite operators need not reclaim disturbance or obtain a mining permit (called an open cut contract) for bentonite exploration or for mining of less than 10,000 cubic yards of material from any one site. Above that level a mining and reclamation plan is required.

Resource Protection Standards

The issuance of permits to operators under the above acts is considered a state action and requires the Department of Environmental Quality to comply with the Montana Environmental Policy Act (MEPA). MEPA is similar to the National Environmental Policy Act, with provisions for public involvement and preparing environmental assessments or EISs. MEPA has no provisions for formal appeals, but Montana law allows for up to 90 days for filing suit in state court.

Montana has no state processes analogous to the National Historic Preservation Act for identifying and mitigating impacts to historic properties. Montana does have a requirement to consider cultural resources.

Montana also has no state law analogous to the federal Endangered Species Act or Migratory Bird Treaty Act. Since takings under these acts are prohibited independently of any BLM requirements, the state project review conditions approval on compliance with these federal statutes.

Montana has no formal requirement for government-to-government consultation between the state and American Indian governments similar to the federal process. As a matter of practice, however, the state involves the tribal governments much as they do the counties, and the MEPA process allows for active participation by any citizen or governmental unit.

Enforcement, Shut Down, and Bonding

The staff of the Department of Environmental Quality (DEQ), Environmental Management Bureau consists of 19 people, including 13 inspectors. All permitted operations are inspected at least once yearly. Larger operations and operations using cyanide are inspected at least four times a year. Operations with potential for acid rock drainage are inspected as determined to be proper by DEQ.

For all exploration a bond must be posted in the amount of the estimated actual cost for the reclamation to be performed by the DEQ. For operating permits reclamation bonds are based on the actual cost for the agency to implement the approved reclamation plan. This bond amount is reviewed at least every 5 years. Several major mines have been required to provide long-term bonding for establishing trust funds. The trust funds are to be used for postclosure water capture and treatment over an indefinite period of time. A reclamation bond must also be posted for bentonite operations.

Violations of the above acts are punishable by fines. Failure to comply with other Montana environmental laws such as the Water Quality Act or Air Quality Act are also punishable by fine, and operations may be enjoined from continuing.

Significant Differences

Montana has no state requirement for reclaiming small operations that do not use chemicals and disturb less than 5 acres [SMES (small miner exclusion statement) Operations]. Montana also does not require small bentonite operators conducting exploration or mining less than 10,000 cubic yards, to reclaim disturbance.

Montana does consider small exploration projects disturbing less than 5 acres as a state action subject to the Montana Environmental Policy Act and requiring a reclamation bond, whereas BLM would not consider the same project a federal action subject to the National Environmental Policy Act and does not require a reclamation bond for Notice-level projects. The state bonds small exploration projects and small chemical processing and placer operations for reclamation. BLM cannot require a reclamation bond for these small projects conducted under Notices.

NEVADA

Locatable mineral activities on BLM lands in Nevada are regulated by the Nevada Division of Environmental Protection under Nevada Administrative Code NAC 445A.350 through 445A.447 and NAC 519A.010 through 519A. The NAC 445A regulations govern design, construction, operation, and closure of mining operations. The NAC 519A regulations cover reclamation and closure to a post-mining productive land use for mining and exploration projects.

Locatable mineral activities that will ultimately become mining operations are regulated through a variety of state programs and permits. The Division of Minerals monitors mineral production and manages the State Bond Pool. The Division of Environmental Protection programs regulate air quality, solid waste management, hazardous waste management, ground water, and mining. Permits include air quality, solid waste management, hazardous waste management, ground water, mining, National Pollutant Discharge Elimination System (NPDES) discharge, storm water under NPDES, general permits, and underground injection control. The Division of Water

Resources regulates the appropriation of public waters, tailings dam permits, and mineral exploration hole plugging. The Division of Wildlife monitors endangered wildlife, industrial artificial pond permits, and dredging permits. The Division of Health issues permits for sanitation facilities and radioactive materials licenses. The State Fire Marshal Division issues hazardous materials permits and monitors fire and life safety.

Plan Threshold and Submission Requirements

Nevada does not require a reclamation permit for Notice-level operations under 5 acres or operations that mine less than 36,500 tons per year. Water pollution control permits (PCP) are issued for any size of operation that uses process fluids. Leaching operations require a PCP regardless of size.

Nevada does not have a "casual use" threshold or no specific criteria for suction dredging at a casual use level.

Information required for state permits is generally the same as that required by BLM, except for riparian and wildlife habitat information.

Performance Standards

Nevada has performance standards for ground water as well as monitoring requirements. The state has revegetation standards consistent with BLM and considers a requirement for backfilling open pits on a case-by-case basis. Open pits and rock faces, however, can be excluded by regulation. The state has the authority to regulate the testing, control, and monitoring of acid-forming materials (for pit lakes and dumps) and to control operations that use process fluids. Nevada performance standards cover air, water, and other resources and allow variances through a permit modification process.

Nevada generally inspects large mines that use cyanide or produce acid-forming materials three times per year or more, medium-sized mines three times per year, and small mines yearly.

Resource Protection Standards

Nevada does not have a specific statutory provision to protect threatened and endangered species and does not offer statutory protection to historical, archaeological, paleontological, or cave resources.

Nevada has no state NEPA law but uses a process for public involvement in the review and permitting process for mines. No special provisions require consultation with American Indian governments, but these governments can comment through the state's public comment process.

Enforcement, Shut Down, and Bonding

The staff of the Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation consists of 18 people, including three inspectors. Operations are inspected one to three times per year with no fixed schedule unless problems are found. Then the frequency is increased. The state handles bonding through a state bond pool for small operators up to $1 million. The state also allows for corporate guarantees and holds bonds for private lands. There is no bonding for Notice-level operations. Regulations pertaining to shut-down operations differ from those proposed by BLM. Operators are required to file a final permanent closure plan 2 years before shutting down. Operations are allowed to shut down temporarily but must maintain site integrity.

Significant Differences

Substantive regulatory differences between the Nevada state program and the existing 3809 regulations include no state equivalent for Notices for exploration less than 5 acres and no baseline information required for riparian or wildlife habitat for permits. Nevada accepts corporate guarantees in lieu of a bond, and BLM Nevada accepts the state's corporate guarantees. Nevada has no specific state statutes for threatened and endangered species, the National Historic Preservation Act, the Archaeological Resources Protection Act, or cave resources protection.

NEW MEXICO

Locatable mineral activities on BLM lands in New Mexico are regulated by the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals, and Natural Resources Department under the authority of the New Mexico Mining Act of 1993. The New Mexico Mining Act Rules are published in New Mexico Statutes, Section 69-36-1, et. seq.

Permits are required for various levels of mining and exploration on the basis of the area of proposed surface disturbance, the volume of material to be removed, or both. The New Mexico Mining Act distinguishes between new and existing operations. Existing operations, those grandfathered at the time of the effective date of the act, are subject to less regulation than new operations. BLM surface management regulation standards are most comparable to the state's "new operations" standards. The state regulatory program applies to federal, state, and private land. It does not apply to Indian land.

Plan Threshold and Submission Requirements

New Mexico has a casual use type exemption for "prospectors, gold panners, and rock collectors causing no or very little surface disturbance and not using mechanized sluices or dredges." To be exempt, excavations must involve less than 2 cubic yards/year.

New Mexico's Notice-type mining permit is called a general permit. A general permit is issued upon application, with the operator's agreeing to the permit terms upon signing it. A General permit (wet) is for operations in water, including all suction dredging, regardless of hose intake

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size. Wet operations must not exceed 2 cubic yards/day and 100 cubic yards/year. Dry operations must not exceed 200 cubic yards/year, with no more than 25/cubic yards and 2 acres unreclaimed at one time.

Plan-type permits (i.e. require an application, review, and approval) include both exploration and mining and are categorized as minimal impact and other than minimal impact. The minimal/nonminimal impact threshold is based on the total area of proposed surface disturbance, the total volume of material to be removed, or both. Additionally, any permit, including a general permit, may be upgraded to a nonminimal impact permit if the operation falls within or exhibits at least one of nine disqualifying characteristics, which include disturbing environmentally sensitive areas and other specifically listed environmental risks, such as leaching operations and potential for release of acid or toxic substances.

Information requirements and performance standards for state permits are equivalent to those required by BLM regulations. The state's "permit area" is equivalent to BLM's "project area."

Performance Standards

Operations must meet New Mexico State water quality standards as enforced by the State Environmental Department (ED), which regulates both surface and ground water quality. In conjunction with Mining and Minerals Division, the Environment Department, under state water quality regulations, can regulate the testing, control, and monitoring of acid-forming materials and control leaching operations.

The New Mexico Mining Act Rules include standards for topsoil and revegetation. Backfilling is required "only when needed to achieve reclamation objectives that cannot be met through other mitigating measures." The most appropriate technology and the best management practices must be used in mining and reclamation. At least two inspections per year are required under the Mining Act for all active mining operations. Under certain conditions, a variance from a performance standard may be granted.

Resource Protection Standards

Under various authorities the State of New Mexico protects game animals and migratory birds. The State Wildlife Conservation Act protects state-designated threatened and endangered species, but this law lacks the enforcement authority of the federal Endangered Species Act.

The State of New Mexico has a cave protection law that protects caves, including those on federal land.

A variety of state historic and prehistoric resources protection acts (including protection of ancient burial sites) apply to state and private lands only. The National Historic Preservation Act and Archaeological Resources Protection Act apply to federal lands. BLM coordinates with the State Historic Preservation Division in enforcing these laws on federal land.

No state statutes are specific to protecting paleontological resources.

New Mexico has no state National Environmental Policy Act (NEPA) law, but the Mining Act requires an "environmental evaluation" as well as public notification and participation as part of the permitting process. The Mining Act does not include any special provision for consulting with American Indian governments. Locatable-type mining activities on Indian lands are not regulated under the act.

Enforcement, Shut Down, and Bonding

The staff of the Mining Act Reclamation, Bureau of Mining and Minerals Division consists of seven persons, five of whom perform inspections along with their other duties. Active operations are inspected twice a year.

Financial assurance (bonding) is required of all new operations except operations under a general permit and certain minimal impact operations. The amount of financial assurance is the cost of a third party to reclaim the operation.

An operator may qualify for a permit for standby status if operations are inactive for more than 180 days.

The state may issue a notice of violation (NOV) if the violation does not cause imminent danger to health and safety or significant imminent environmental harm. A NOV fixes a time for abatement and may involve a civil penalty. A cessation order (CO) is issued if a violation causes imminent danger to health and safety or significant imminent environmental harm or if a NOV is not timely abated. A cessation order may also involve a civil penalty.

Significant Differences

The state issues seven permits, depending upon whether an operation is new or existing; minimal impact or nonminimal impact; mining or exploration. The minimal/nonminimal impact thresholds are based on total surface disturbance, the amount of material extracted, or both. Additionally, nine specific resource and environmentally sensitive criteria can place a minimal impact permit into a nonminimal status. These factors preclude a direct comparison of the state permitting system with BLM's two-tier system.

New Mexico's Plan-type permits require financial assurance (bonding), but not all Notice-type permits require bonding. No financial assurance is required for general permits, minimal impact exploration permits, and minimal impact mining permits of less than 2 acres total disturbance.

OREGON

Locatable mineral activities on BLM lands in Oregon are regulated through several agencies. The Oregon Department of Geology and Mineral Industries (DOGAMI) issues permits and inspects surface mineral exploration, development, and production operations on lands in the state and is the lead coordinating agency for state mining regulations. Other state permitting agencies include the Oregon Department of Environmental Quality, the Oregon Water Resources Board, and the Oregon Division of State Lands.

Plan Threshold and Submission Requirements

An Operating Permit is not required for mining less than 50 cubic yards within streambeds and streambanks or if an operation moves less than 5,000 cubic yards or disturbs less than 1 acre per year. All other operations require a permit and approval. Oregon's requirements for Plans and Notices are generally the same as BLM's. The Oregon definition of project area does not conflict with BLM's.

Performance Standards

Oregon has a chemical mining rule (Chapter 632, Division 37) governing operations that use leaching methods.

Oregon standards for ground water protection require that the operator maintain premine quantity and quality. Monitoring and reporting programs include surface and ground water, water balance of the process system, leak detection system, and fish and wildlife injury and mortality. The reclamation and closure plan section includes about 18 provisions for protecting public health, safety, and the environment. Backfilling is considered on a case-by-case basis. The technology-based operational standards used are "best available, practicable, and necessary technology" for chemical processing.

Resource Protection Standards

The following provisions to protect fish and wildlife are developed by the Department of Fish and Wildlife: zero mortality, covering and containing wastewater facilities to preclude wildlife access, no overall net loss of habitat value, and no loss of existing critical habitat. Oregon offers statutory protection to historical (National Historic Preservation Act) and cultural sites (Archaeological Resources Protection Act), but not to paleontological or cave resources.

No state National Environmental Policy Act (NEPA) law or process applies to mining operations. No special provisions apply to consultation with Native American governments.

Enforcement, Shut Down, and Bonding

The staff of the Oregon Mined Land Reclamation Program/Department of Geology and Mineral Industry consists of eight people, including four inspectors. Oregon imposes civil penalties of not less than $200 per day and not more than $50,000 per day for any violation.

UTAH

Locatable mineral activities on BLM lands in Utah are regulated by the Department of Natural Resources, Division of Oil, Gas and Mining (DOGM), Minerals Reclamation Program under the Utah Mined Land Reclamation Act, Title 40-8, Utah Code Annotated, 1975 as amended. This regulation is accomplished through a variety of state programs and permits that apply to mineral activities on state, private, and federal lands within Utah.

Plan Threshold and Submission Requirements

Utah has a "casual use" type exemption. A permit is not required if no significant surface resource disturbance and no mechanized earth-moving equipment are involved. Recreational dredging and sluicing application provisions do not conflict with BLM's.

The DOGM issues three types of permits under the Utah Mined Land Reclamation Act: Notice of Intention to Conduct Exploration, Notice of Intention to Commence Small Mining Operations, and Notice of Intention to Commence Large Mining Operations. A Notice of Intention to Conduct Exploration does not require DOGM approval unless the proposed activity involves more than 5 acres. A Notice of Intention to Conduct Small Mining Operations does not require DOGM approval but may not exceed 5 acres at any time. A Notice of Intention to Conduct Large Mining Operations is filed on operations that disturb more than 5 surface acres at any time and must be approved by DOGM before mining begins. In addition, a reclamation contract must be executed before mining can begin.

The definition of "project area" is functionally equivalent to BLM's. Filing requirements are similar to the information BLM requires. An annual permit fee is required.

Performance Standards

Utah encourages the use of best available technology (BAT) for mining activity and best management practices (BMP) for water quality protection. The state has specific standards for ground water quality and may require ground water monitoring. Utah also requires suitable soil material to be stockpiled for later redistribution and recontouring. In addition, the site must be revegetated to 70% of premining vegetative ground cover. Roads, pads, dams, impoundments, trenches, pits, waste piles, and spoil piles must be reclaimed. Highwalls must be reduced, but open pits need not be backfilled.

Utah has authority to regulate the testing, control, and monitoring of acid-forming materials or operations that use leaching. Utah also has standards for ground water (BMP) that BLM does not have and provides variances for operational and reclamation standards. Standards for Notice- and Plan of Operations-type operations are similar to those required by BLM. DOGM requires inspections of all mining operations but on an as-needed basis.

Resource Protection Standards

Utah state law protects fish and wildlife, specifically threatened and endangered species, but not plant species. Utah offers statutory protection for archeological and paleontological resources but not caves and cave resources.

Utah has no state National Environmental Policy Act (NEPA) law. The public is given notice and may appeal Board of Oil, Gas and Mining decisions only for large mining operations.

Enforcement, Shut Down, and Bonding

The staff of the Utah Minerals Reclamation Program consists of five people, including three inspectors. Operations are inspected on an as-needed basis. Utah bonds Plan-type operations and exploration that disturbs more than 5 acres. Regulations for shutting down mining operations require state notification. Mining operations may have to be reclaimed after 5 years of continued suspension and must be reclaimed when the suspension periods exceed 10 years.

The Board of Oil, Gas and Mining may take any enforcement action authorized by law, including requiring the operator to comply, abate, mitigate, cease operations, forfeit surety, or reclaim an operation. In addition, a civil suit or any other lawful action may be taken.

Significant Differences

Substantive differences exist between the Utah state program and the existing 3809 regulations. Utah requires no set schedule for inspecting any mining operations, no protection for caves and cave resources, no protection for threatened and endangered plant species, and the collection of permit fees. Utah's archeological and paleontological resource statutes, while helpful, are not considered equivalent to federal laws.

WASHINGTON

Locatable mineral activities on BLM lands in Washington are regulated by the Department of Natural Resources (DNR) and the Department of Ecology (DOE) under the State Code.

Plan Threshold and Submission Requirements

Washington does not require a permit for disturbing less than 3 acres, nor does it have special provisions for leaching operations.

The information that the State of Washington requires for plans is generally equivalent to that required by BLM. The Washington definition of project area does not conflict with BLM's, but surface mine access roads are not included in the state definition of "disturbed areas."

Performance Standards

Washington State has a general requirement for preserving topsoil and for revegetation but no requirement for backfilling. The state does not require the testing, control, and monitoring of acid-forming materials, and there is no state authority relating to operations that use leaching. Washington has no technology-based operational standards, such as best management practices or best available technology. Washington also has no requirements governing cyanide operations or acid rock drainage resulting from mining.

Resource Protection Standards

Washington has no state protection for caves and cave resources. It offers statutory protection to cultural resources (NHPA) but not to paleontological resources.

Washington has a State Environmental Policy Act, which is functionally equivalent to the National Environmental Policy Act and allows for public comment in the environmental review and decisionmaking process for mining. No special provisions apply to consulting with American Indian governments.

Significant Differences

The Washington State program and the existing 3809 regulations differ in that Washington has a 3-acre exemption on "casual use" type operations; has no specific requirements relating to cyanide or acid rock drainage; has no state protection for caves, cave resources, or paleontological resources; and has no technology-based performance standards.

WYOMING

Locatable mineral activities on BLM lands in Wyoming are regulated by the Wyoming Department of Environmental Quality, Land Quality Division (DEQ/LQD) based on Section 35-11-(401-437) of the State Code. Regulation is accomplished through a variety of state regulatory programs and permits that apply to mineral activities on all lands in the state: private, state, and federal.

Plan Threshold and Submission Requirements

The level of noticeability of a perceived impact or disturbance dictates whether written authorization is required by BLM or the Department of Environmental Quality. The use of mechanical equipment or other methods that noticeably disturb the land will always initiate permit, license, notice, plan, or other use authorization. The Land Quality Division issues the following authorizations:

1. **Letter of Authorization** for small disturbances with minimal, infrequent impacts such as a smaller than 3-inch recreational suction dredging.
2. **Exploration by Drilling Permit** for all exploratory drilling for locatable minerals.
3. **Exploration by Dozing Permit** for all exploration work done by mechanical earthmoving equipment.
4. **Limited Mining Operations Permit** for a mining disturbance of 10 acres or less for the life of the mine. This permit can be obtained only for limestone, feldspar, sand, gravel, scoria, ballast, dolomite, or shale.
5. **Small-Mining Permit** for an operation involving 10,000 yards or less of overburden and 10 acres of affected land in any 1 year.
6. **Regular Mining Permit** for all larger mining operations not covered under other permits, licenses, or authorizations.

Wyoming has no acreage threshold per se for locatable mineral operations. Information required for Land Quality Division (LQD) authorizations is functionally equivalent to Notices and Plans required by BLM, except LQD requires information in much greater detail. The Wyoming definition of project area does not conflict with BLM's. The BLM and LQD cooperative agreement states the following: "Consistency must be maintained in the application of criteria for delineating the project areas. All lands included in a permit to mine, including roads, are part of the project area, but only the federal surface estate is subject to BLM review."

Performance Standards

Wyoming has standards for ground water resources as well as a monitoring program. The state requires topsoil preservation, revegetation, and partial backfilling. Wyoming also has authority to test, control, and monitor acid-forming materials for their impact to water quality but not operations that use leaching since Wyoming has no leaching operations. In situ uranium leaching is heavily regulated. The technology-based operational standards used are "best technology currently available."

Wyoming's performance standards for ground water are not covered by BLM. The state has a process to obtain variances to its performance standards. Notice-type operations are subject to the same performance standards as are Plan-type operations. The state has no specific requirements governing cyanide operations or acid rock drainage, but these operations would be permitted and inspected like other operations that could contaminate the land and surface and ground waters.

Resource Protection Standards

Wyoming has no specific statutory provision to protect threatened and endangered species, although fish and wildlife are protected under the federal Endangered Species Act. Wyoming also has no state law like the National Historic Preservation Act for identifying and mitigating impacts to historic properties. But the Wyoming State Historic Preservation Officer (SHPO) is consulted before surface-disturbing operations. Wyoming offers no statutory protection to caves or cave resources unless they contain historic or cultural values.

Wyoming has a state National Environmental Policy Act law but uses a public process for obtaining input in the environmental review and decisionmaking process for mine approval. Wyoming has no special provisions for consulting with American Indian governments.

Enforcement, Shut Down, and Bonding

The staff of the Wyoming LQD consists of 45 people, including 24 inspectors. Permitted operations are inspected at least annually with other inspections as deemed proper by LQD.

The state has a bonding program for full reclamation of all mining operations. The bond is basically either $1,000 per acre of affected land or the estimated cost of reclamation as outlined in a written proposal computed by established engineering principles. Bond amount can be modified with justification.

If an operator is in noncompliance with the requirements of the permit to mine, a notice of noncompliance (NON) is issued. If the NON requirements are not met in the prescribed time action will be initiated to pull the bond, terminate the operation, and have the Wyoming Attorney General bring suit to recover cost of reclamation if the bond is inadequate. Persons violating the provisions of the Environmental Quality Act are subject to a temporary or permanent injunction and a penalty not to exceed $10,000 for each violation for each day during which the violation continues.

Regulations for shut-down operations allow for temporary cessation of operations for periods up to 5 years. State regulations do not conflict with BLM regulations.

Significant Differences

The Wyoming Land Quality Division requires the bonding of all noticeable surface-disturbing operations whereas BLM cannot require a bond for Notice-level operations.

Regulatory differences between the Wyoming State program and the existing 3809 regulations include the following. Wyoming exercises some control of casual use-type operations; requires bonding for all operations; has no specific program for cyanide, acid rock drainage, and leaching (except in situ) operations; does not inspect cyanide operations since there are none; and offers no protection for cave resources.

APPENDIX E
CHANGES IN MINERAL ACTIVITY

FUTURE MINERAL ACTIVITY

To help assess the reasonably foreseeable environmental impacts of the proposal and alternatives, several assumptions were developed on future mineral exploration and development under existing regulations, management practices, and policies. These assumptions are fairly general, given the diversity of mining on public lands, variety of mining methods, commodities extracted, geographic scope, and inherent uncertainty of the commodities markets. Projections on the number of Notices and Plans expected in the future are based on historic trends in mining activity (generally dating back to 1980, when the original 3809 regulations took effect), and current trends in commodity markets, exploration, and technological changes.

The following assumptions were used to project the amount of activity that might be reasonably foreseeable.

1. The rate of exploration will remain about the same in the United States. Dollars will continue to increase worldwide but overall remain constant within the United States.

2. Most domestic exploration will be for expansion of existing mines (satellites) rather than for new discoveries.

3. Existing mines will expand to take advantage of new technology and will increasingly extract refractory-grade ores. Technology will continue to advance.

4. Land/mineral base under federal ownership will remain the same in the lower 48 states. In Alaska, claimants on lands that were or will be selected by the State of Alaska have the option of maintaining a federal claim or switching to a state claim. Virtually all placer mining in Alaska will eventually move off public land.

5. The gold price trend will remain relatively stable, based on 10-year averages. But an extended period of lower or higher prices will affect short-term decisions.

6. The past trend in the number of mining Notices and Plans of Operations is an indicator of future level of activity.

7. The current geographic distribution of activity will stay the same. For example, large open pit gold mining will remain concentrated in Nevada. Placer mining will be concentrated in Alaska. Arizona will dominate large open pit copper mining. And industrial mineral mining will remain more evenly distributed across the study area.

8. Domestic industrial minerals production will continue to increase. The portion of total domestic production on public land will increase at a faster rate than the overall domestic rate of

increase because previously patented lands will be mined out and production will continue to shift from the eastern to the western United States, where public lands are concentrated.

9. Gold production will remain constant on the basis of production over the 5-year period from 1992 to 1996, during which gold production has been more or less constant. Generally the number of mining operations will also remain constant. More mines are starting to close than open, but mining for industrial minerals will increase.

10. Industrial mineral operations will cause a comparable amount of surface disturbance as precious metals mines, but the degree of impacts will be lower, e.g. fewer water quality impacts.

11. Overall mineral activity on public lands, including the number of Notices and Plans of Operations filed with BLM, will remain steady or slightly decline. Projections on the number of Notices and Plans and acres of disturbance expected under current management are discussed in the Mineral Resource Development section of Chapter 3.

CHANGES IN MINERAL ACTIVITY

Expected changes in mineral activity levels were also estimated for each alternative. As with the assumptions for future mineral activity discussed above, it is neither practical nor even possible to develop complete information on future changes in mineral activity resulting from the implementing of regulatory alternatives. The approach used to document the reasonably foreseeable significant effects conforms to the requirements at 40 CFR Part 1502.22 when dealing with situations where information is incomplete or unavailable. The process used to estimate change in mineral activity, however, has substantial limitations. As such, the estimates are presented as reasonably foreseeable assumptions on future activity. The changes in mineral activity estimates are intended to help evaluate the environmental consequences of the proposed regulations and alternatives, specifically to give the public and decisionmakers information on the potential direction and magnitude of change. The assumptions are estimates of the expected change in mineral activity and should not be considered factual data, or accurate or precise estimates of change.

The changes in mineral activity estimates were based on interpretations by EIS team members of several information sources. These information sources include impact matrixes and mine cost models (discussed below) developed for this EIS, in addition to team member expertise, knowledge, and experiences. The processes for interpreting these information sources were not standardized. Each team member independently interpreted the impact matrices and mine cost model results. The team then compiled and discussed the estimates of change. At several other rounds estimates of change were collected, compiled, and discussed. Through this iterative process a group estimate was reached for each of the 10 mine types and sizes.

The process used by the EIS team to estimate change in mineral activity and also to construct the impact matrixes is generally referred to as the Delphi Method. The Delphi Method is a decision-making or forecasting process designed to address highly complex or ambiguous issues where factual data is absent. The process was originally developed by the Rand Corporation, a U.S. intelligence "think tank." The process is widely accepted and used to forecast future events and outcomes.

Changes in mineral activity can be manifested in a several ways, including changes in exploration and mining operations, acres disturbed, mine life, cutoff grade, and annual production. The response to changes in the regulations will be unique for each operation. As such, the following discussion is limited to change in activity without attempting to define how that change may be manifested. Table E-1 gives a breakdown of the expected changes by type of mineral activity for each alternative except Alternative 1, where no change in activity is expected.

Table E-1. Percent Change in Mineral Activity

Alternative	Recreational Mining	Exploration		Placer		Open Pit		Underground		Strip Mine
		Small	Large	Small	Large	Small	Large	Small	Large	
2	0	+<5	+5	+<5	+5	+<5	+5	+<5	+<5	+<5
3	-<5	-5	-<5	-5	-<5	-5	-5	-5	-<5	-<5
4	-5	-20	-15	-15	-10	-25	-30	-15	-10	-5

Alternative 1. The No Action Alternative assumes that the current management and regulations continue unchanged. Thus the regulations are not be expected to alter existing or future levels of mining. This does not necessarily mean that the level of future mining would not change. (See the discussion above on other factors that affect mining activity.) For this EIS, however, the overall future of mining under the Mining Law is assumed to remain relatively steady under existing regulations, management practices, and policies.

Alternative 2. The State Management Alternative would eliminate BLM's role in regulating activity under the Mining Law on public lands. In most states this regulatory approach is expected to reduce the regulatory burden to mining operations, thus increasing the level of mineral activity. Except for recreational mining, overall mineral activity on public lands is assumed to increase by 5% or less under Alternative 2. The greatest increase in activity is expected in larger mining operations, specifically those now requiring EISs with extensive baseline studies. But this reduction in regulatory burden and associated increase in activity would not occur uniformly in all states. For example, California and Montana have state versions of the National Environmental Policy Act. Proposed operations in those two states would not avoid the costs and time delays of preparing EISs. For a better understanding of the types of state programs in place, see Appendix D.

Alternative 3. For the proposed regulations it is assumed that the overall level of mineral activity on public lands under the Mining Law will decline by 5% or less. The proposal would likely have negligible affects on recreational mining or large exploration, placer, underground, and strip mining operations. The proposed regulations would, however, have a greater effect on small exploration and mining operations in addition to large open pit mines. Specifically, the small exploration and mining operations in addition to large open pit mines. Specifically, the financial guarantee and Notice/Plan threshold provisions would likely raise operating costs at small operations by about 30%. For large open pit mines the backfilling provision could greatly increase operating costs and reduce activity. But because of the discretion given BLM in the proposed backfilling provision, changes in costs and activity levels are extremely difficult to estimate and would likely vary by office.

Alternative 4. The alternative that is likely to most reduce overall mineral activity would also give the greatest level of environmental protection. Depending on the type of activity, Alternative 4 is assumed to reduce mineral activity by from 5 to 30%. Many of the provisions would reduce activity levels, including eliminating the Notice provision, requiring claim validity before mining, mandatory penalties and enforcement, automatic stays of all appealed decisions, mandatory backfilling, and establishing specific unsuitability criteria.

IMPACT MATRIXES

One analytic tool used to assess the potential effects of the proposed regulations and alternatives on future mining consists of impact matrixes (See Tables E-2, E-3, and E-4). The rating, weights and scores in these matrixes were developed using a qualitative process based on the expertise of EIS team members. The process is not intended to generate precise measurements of changes, but rather to show the direction and size of those potential changes and which regulatory provisions are likely to have the most effect.

The regulatory provisions were grouped into 25 regulation components (e.g. Notice-Plan Threshold, Appeals Process and Stay Provisions, Performance Standards: Pit Backfilling), and 10 mine types and sizes (e.g. small placer, large open pit). Specialists on the EIS team independently rated the effect each regulation component would have on the different types and sizes of mines, using the following scale: negligible or none = N, low positive or negative = L±, medium positive or negative = M±, and high positive or negative = H±. The team then compiled and discussed the ratings. At several other rounds ratings were collected, compiled, and discussed. Through this iterative process a group rating was reached for each of the 25 regulation components. Tables E-2, E-3, and E-4 show the ratings for each of the provisions.

A similar process was used to obtain a weight for each of the regulation components. A weight (1 through 5) was intended to scale the relative importance of each of the regulation components. For example, the weight for the regulatory provision category covering *Pit Backfilling* was considered to have one of the highest relative importance, and was given a weight of 5. The *Stability, Grading, and Erosion Control* category, although important, was considered relatively less important and assigned a weight of 3. Definition of the *Project Area* was assigned a weight of 1, as it was considered one of the least important provisions relative to the other issues being considered in its potential to affect mining operations. The weights can be found in the second column, following the description of the regulation component, in each of the impact matrices.

The ratings and weighs were then used to estimate the anticipated effects of the 25 regulatory categories on each sector of the industry, the "score." To simplify the scoring, a numerical value

Table E-2. Alternative 2 Impact on Mineral Activity by Type and Size of Operation																							
		Recreation and Hobby Activity		Exploration				Placer Mining				Open Pit Metal Mine				Underground Metal Mine				Industrial Mineral Mine	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score
Definition of Federal Lands Where Regulations Apply	2	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Notice vs. Plan of Operations Threshold	5	N	0	L+	5	L+	5	L+	5	L+	5	L+	5	L+	5	L+	5	L+	5	L+	5
Definition of *Casual Use*	1	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Notice and Plan of Operations Content and Processing Requirements	3	N	0	L+	3	M+	9	L+	3	M+	9	L+	3	M+	9	L+	3	L+	3	L+	3
State and Federal (BLM) Coordination	3	N	0	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3
Claim Validity/Valid Existing Rights and Economic Viability	4	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Common Variety Materials Determinations	2	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Inspection and Monitoring Requirements	2	N	0	L+	2	L+	2	L+	2	L+	2	L+	2	L+	2	L+	2	L+	2	L+	2
Penalties and Enforcement Procedures	3	N	0	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3
Financial Guarantee (Bonding) Requirements	4	N	0	N	0	L+	4	N	0	L+	4	N	0	L+	4	N	0	L+	4	L+	4

Table E-2. Alternative 2 Impact on Mineral Activity by Type and Size of Operation																					
		Recreation and Hobby Activity		**Exploration**				**Placer Mining**				**Open Pit Metal Mine**				**Underground Metal Mine**				**Industrial Mineral Mine**	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score
Appeals Process and Stay Provisions	3	N	0	N	0	L+	3	N	0	L+	3	N	0	L+	3	N	0	L+	3	L+	3
Project Area Definition	1	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Applying Regulation Changes to Existing Operations	4	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Administrative Impact Subtotal			0		16		29		16		29		16		29		16		23		23
***Performance Standards:* Land Use Plans**	3	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Stability, grading, and erosion control	3	N	0	L+	3	N	0	L+	3	N	0	L+	3	N	0	N	0	N	0	L+	3
Pit Backfilling	5	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Roads and Structures	3	N	0	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3
Leaching and Processing Operations	4	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Surface and Ground Water Protection	5	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0

Table E-2. Alternative 2 Impact on Mineral Activity by Type and Size of Operation

		Recreation and Hobby Activity		Exploration				Placer Mining				Open Pit Metal Mine				Underground Metal Mine				Industrial Mineral Mine	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score
Acid-Forming and Other Deleterious Material	4	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Topsoil or Growth Medium Handling	3	N	0	L+	3	N	0	L+	3	N	0	L+	3	N	0	L+	3	N	0	L+	3
Revegetation	3	N	0	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3	L+	3
Fish and Wildlife Protection/Restoration	3	N	0	L+	3	L+	3	M+	9	M+	9	M+	9	M+	9	L+	3	M+	9	M+	9
Wetlands and Riparian Protection/Restoration	3	N	0	L+	3	L+	3	M+	9	M+	9	L+	3	M+	9	L+	3	M+	9	M+	9
Cultural, Paleo, Cave Resource Protection	3	N	0	M+	9	H+	15	M+	9	H+	15	M+	9	H+	15	M+	9	H+	15	H+	15
Performance Standards Impact Subtotal			0		27		27		39		39		33		39		24		39		45
Administrative and Performance Standard Impact Total			0		43		56		55		68		49		68		40		62		68

Table E-3. Alternative 3 Impact on Mineral Activity by Type and Size of Operation

		Recreation and Hobby Activity		Exploration				Placer Mining				Open Pit Metal Mine				Underground Metal Mine				Industrial Mineral Mine	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score
Definition of Federal Lands Where Regulations Apply	2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2
Notice vs. Plan of Operations Threshold	5	L-	-5	M-	-15	N	0	M-	-15	N	0	H-	-25	N	0	H-	-25	N	0	L-	-5
Definition of *Casual Use*	1	M-	-3	L-	-1	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Notice and Plan of Operations Content and Processing Requirements	3	L-	-3	L-	-3	L-	-3	L-	-3	M-	-9	M-	-9	L-	-3	M-	-9	L-	-3	L-	-3
State and Federal (BLM) Coordination	3	L+	3	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Claim Validity/Valid Existing Rights and Economic Viability	4	N	0	M-	-12	M-	-12	M-	-12	M-	-12	M-	-12	M-	-12	M-	-12	M-	-12	M-	-12
Common Variety Materials Determinations	2	N	0	M-	-6	N	0	N	0	N	0	N	0	N	0	N	0	N	0	L-	-2
Inspection and Monitoring Requirements	2	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Penalties and Enforcement Procedures	3	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3
Financial Guarantee (bonding) Requirements	4	N	0	L-	-4	L-	-4	H-	-20	L-	-4	H-	-20	L-	-4	H-	-20	L-	-4	L-	-4

Table E-3. Alternative 3 Impact on Mineral Activity by Type and Size of Operation

		Recreation and Hobby Activity		Exploration				Placer Mining				Open Pit Metal Mine				Underground Metal Mine				Industrial Mineral Mine	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score
Appeals Process and Stay Provisions	**3**	**N**	**0**	**L-**	**-3**	**L-**	**-3**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**
Project Area Definition	**1**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**
Applying Regulation Changes to Existing Operations	**4**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**M-**	**-9**	**L-**	**-3**	**N**	**0**	**N**	**0**	**N**	**0**
Administrative Impact Subtotal			**-13**		**-49**		**-27**		**-55**		**-39**		**-80**		**-27**		**-71**		**-24**		**-31**
***Performance Standards:* Land Use Plans**	**3**	**L-**	**-3**	**L-**	**-3**	**L-**	**-3**	**L-**	**-3**	**L-**	**-3**	**L-**	**-3**	**M-**	**-9**	**L-**	**-3**	**L-**	**-3**	**M-**	**-9**
Stability, Grading, and Erosion Control	**3**	**L-**	**-3**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**L-**	**-3**	**L-**	**-3**	**L-**	**-3**	**L-**	**-3**	**L-**	**-3**
Pit Backfilling	**5**	**N**	**0**	**N**	**0**	**N**	**0**	**L-**	**-5**	**L-**	**-5**	**M-**	**-15**	**M-**	**-15**	**N**	**0**	**N**	**0**	**N**	**0**
Roads and Structures	**3**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**
Leaching and Processing Operations	**4**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**L-**	**-4**	**L-**	**-4**	**L-**	**-4**	**L-**	**-4**	**L-**	**-4**
Surface and Ground Water Protection	**5**	**N**	**0**	**L-**	**-5**	**L-**	**-5**	**L-**	**-5**	**L-**	**-5**	**L-**	**-5**	**L-**	**-5**	**L-**	**-5**	**L-**	**-5**	**L-**	**-5**
Acid-Forming and Other Deleterious Material	**4**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**N**	**0**	**L-**	**-4**	**L-**	**-4**	**L-**	**-4**	**L-**	**-4**	**L-**	**-4**

Table E-3. Alternative 3 Impact on Mineral Activity by Type and Size of Operation																							
		Recreation and Hobby Activity		Exploration				Placer Mining				Open Pit Metal Mine				Underground Metal Mine				Industrial Mineral Mine	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score
Topsoil or Growth Medium Handling	4	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Revegetation	3	N	0	M-	-9	L-	-3	M-	-9	N	0	N	0	N	0	N	0	N	0	N	0
Fish and Wildlife Protection/Restoration	3	N	0	L-	-3	N	0	M-	-9	L-	-3	L-	-3	L-	-3	L-	-3	N	0	L-	-3
Wetlands and Riparian Protection/Restoration	3	L-	-3	N	0	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3	N	0	L-	-3
Cultural, Paleo, Cave Resource Protection	3	N	0	L-	-3	N	0	N	0	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3	L-	-3
Performance Standards Impact Subtotal			-9		-23		-14		-34		-22		-43		-49		-28		-22		-34
Administrative and Performance Standard Impact Total			-22		-72		-41		-89		-52		-123		-76		-99		-46		-65

Table E-4. Alternative 4 Impact on Mineral Activity by Type and Size of Operation

		Recreation and Hobby Activity		Exploration				Placer Mining				Open Pit Metal Mine				Underground Metal Mine				Industrial Mineral Mine	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	**Impact**	**Score**	**Impact**	**Score**	**Impact**	**Score**	**Impact**	**Score**	**Impact**	**Score**	**Impact**	**Score**	**Impact**	**Score**	**Impact**	**Score**	**Impact**	**Score**	**Impact**	**Score**
Definition of Federal Lands Where the Regulations Apply	2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2	L-	-2
Notice vs. Plan of Operations Threshold	5	H-	-25	H-	-25	N	0	H-	-25	N	0	H-	-25	N	0	H-	-25	N	0	L-	-2
Definition of *Casual Use*	1	H-	-5	M-	-3	N	0	N	0	N	0	N	0	N	0	N	0	N	0	M-	-15
Notice and Plan of Operations Content and Processing Requirements	3	L-	-3	L-	-3	L-	-3	L-	-3	M-	-9	M-	-9	L-	-3	M-	-9	L-	-3	N	0
State and Federal (BLM) Coordination	3	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	L-	-3
Claim Validity/Valid Existing Rights and Economic Viability	4	N	0	M-	-12	M-	-12	H-	-20	H-	-20	H-	-20	H-	-20	H-	-20	H-	-20	N	0
Common Variety Materials Determinations	2	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	H-	-20
Inspection and Monitoring Requirements	2	N	0	L-	-2	L-	-2	M-	-6	M-	-6	M-	-6	M-	-6	M-	-6	M-	-6	M-	-6
Penalties and Enforcement Procedures	3	L-	-3	M-	-9	M-	-9	M-	-9	M-	-9	M-	-9	M-	-9	M-	-9	M-	-9	M-	-6
Financial Guarantee (Bonding) Requirements	4	N	0	L-	-4	L-	-4	H-	-20	L-	-4	H-	-20	M-	-12	H-	-20	M-	-12	M-	-9

Table E-4. Alternative 4 Impact on Mineral Activity by Type and Size of Operation

		Recreation and Hobby Activity		Exploration				Placer Mining				Open Pit Metal Mine				Underground Metal Mine				Industrial Mineral Mine	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score
Appeals Process and Stay Provisions	3	L-	-3	H-	-15	H-	-15	H-	-15	H-	-15	H-	-15	H-	-15	H-	-15	H-	-15	H-	-15
Project Area Definition	1	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0
Applying Regulation Changes to Existing Operations	4	N	0	N	0	L-	-3	M-	-9	H-	-15	M-	-9	H-	-15	H-	-15	H-	-15	H-	-15
Administrative Impact Subtotal			-41		-75		-59		-109		-80		-115		-82		-121		-82		-95
***Performance Standards:* Land Use Plans**	3	L-	-3	L-	-3	L-	-3	L-	-3	M-	-9	M-	-9	H-	-15	M-	-9	M-	-9	H-	-15
Stability, Grading, and Erosion Control	3	L-	-3	N	0	N	0	N	0	N	0	H-	-15	H-	-15	H-	-15	H-	-15	H-	-15
Pit Backfilling	5	N	0	N	0	N	0	L-	-5	L-	-5	H-	-25	H-	-25	N	0	N	0	L-	-5
Roads and Structures	3	N	0	M-	-9	M-	-9	M-	-9	M-	-9	M-	-9	L-	-3	N	0	N	0	L-	-3
Leaching and Mineral Processing Operations	4	N	0	N	0	N	0	N	0	N	0	M-	-12	M-	-12	M-	-12	M-	-12	L-	-4
Surface and Ground Water Protection	5	N	0	M-	-15	M-	-15	L-	-5	L-	-5	H-	-25	H-	-25	H-	-25	H-	-25	M-	-15
Acid-Forming and Other Deleterious Materials	4	N	0	N	0	N	0	N	0	N	0	H-	-20	H-	-20	H-	-20	H-	-20	L-	-4

Table E-4. Alternative 4 Impact on Mineral Activity by Type and Size of Operation

		Recreation and Hobby Activity		Exploration				Placer Mining				Open Pit Metal Mine				Underground Metal Mine				Industrial Mineral Mine	
				Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		Small <5 acres		Large >5 acres		All Sizes	
Regulation Component	**Wt.**	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score	Impact	Score
Topsoil or Growth Medium Handling	4	N	0	N	0	N	0	N	0	N	0	M-	-9	H-	-15	M-	-9	N	0	M-	-9
Revegetation	3	N	0	H-	-15	H-	-15	H-	-15	M-	-9	M-	-9	M-	-9	M-	-9	M-	-9	M-	-9
Fish and Wildlife Protection/Restoration	3	N	0	M-	-9	M-	-9	H-	-15	M-	-9	M-	-9	M-	-9	L-	-3	L-	-3	L-	-3
Wetlands and Riparian Protection/Restoration	3	L-	-3	M-	-9	M-	-9	M-	-9	L-	-3	M-	-9	M-	-9	L-	-3	L-	-3	L-	-3
Cultural, Paleo, Cave Resource Protection	3	N	0	M-	-9	M-	-9	L-	-3	M-	-9	L-	-3	M-	-9	L-	-3	L-	-3	M-	-9
Performance Standards Impact Subtotal			-9		-69		-69		-66		-58		-154		-166		-108		-99		-94
Administrative and Performance Standard Impact Total			-50		-144		-119		-173		-138		-269		-248		-229		-181		-189

scores for each of the regulatory provision categories.

Table E-5 presents a summary of the scores for all alternatives, broken down by the effects of administrative requirements and effects attributable to the environmental performance standards. To help put these scores in context, the greatest possible score for each alternative is a positive or negative 395.

Alternative 2 - Using this methodology, Alternative 2 received a relatively small positive score for both the administrative and performance standard requirements for all categories of commercial mineral activity. None of the provisions of Alternative 2 were expected to have any effect on recreation and hobby activities.

Several provisions of Alternative 2 were projected to benefit mining on public lands (Table E-2). Provisions with the highest positive scores include Notice and Plan of Operations content and processing requirements; fish and wildlife protection and restoration; wetland and riparian protection and restoration; and cultural, paleontological, and cave resource protection. These positive effects on mining mainly relate to reductions in the following: time delays for reviews and approvals, costs of content and analysis requirements, habitat restoration costs, and costs of documenting and salvaging cultural and paleontological resources.

Because Alternative 2 would rely entirely on the state programs to regulate mining on public lands, this positive effect would not be uniform across all states. For example, California and Montana have state National Environmental Policy Act (NEPA) laws requiring comprehensive environmental review and public participation in the decisionmaking process similar to that currently required on public lands under NEPA. For these two states Notice and Plan content and processing requirements would likely have minimal benefits.

Alternative 3 - For most types and sizes of mining activities the proposed regulations received a relatively small negative score (Table E-3). For small mining operations, specifically Notice-level operations, adverse effects are expected to be somewhat higher than for the larger operations.

The Notice/Plan threshold and financial guarantee provisions are the administrative requirements with the greatest likelihood of adversely affecting mining operations. Except for financial guarantee requirements, large operations would not be affected by these proposed regulation changes.

The pit backfilling provision in the proposed regulations is the environmental performance standard most likely to harm mining operations. Because implementing this provisions would depend on site-specific conditions and the discretion allowed BLM, it is difficult to even qualify the magnitude of the effect across the industry. Clearly, this provision could greatly harm individual open pit mines.

Table E-5. Impact Score Summary on Mineral Activity by Type and Size of Operation

- Alternative -	Recreation and Hobby Activity	Exploration		Placer Mining		Open Pit Metal Mine		Underground Metal Mine		Industrial Mineral Mine
		Small <5 ac.	Large >5 ac.	Small <5 ac.	Large >5 ac.	Small< 5 ac.	Large >5 ac.	Small <5 ac.	Large >5 ac.	All Sizes
Alternative 1 - No Action (Existing Regulations)										
Admin. Impact Subtotal	0	0	0	0	0	0	0	0	0	0
Perf. Std. Impact Subtotal	0	0	0	0	0	0	0	0	0	0
Alternative 1 - Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Alternative 2 - State Management										
Admin. Impact Subtotal	0	16	29	16	29	16	29	16	23	23
Perf. Std. Impact Subtotal	0	27	27	39	39	33	39	24	39	45
Alternative 2 - Total	**0**	**43**	**56**	**55**	**68**	**49**	**68**	**40**	**62**	**68**
Alternative 3 - Proposed Regulations (Proposed Action and Preferred Alternative)										
Admin. Impact Subtotal	-13	-49	-27	-55	-30	-80	-27	-71	-24	-31
Perf. Std. Impact Subtotal	-9	-23	-14	-34	-22	-43	-49	-28	-22	-34
Alternative 3 - Total	**-22**	**-72**	**-41**	**-89**	**-52**	**-123**	**-76**	**-99**	**-46**	**-65**
Alternative 4 - Maximum Protection										
Admin. Impact Subtotal	-41	-75	-50	-109	-80	-115	-82	-121	-82	-95
Perf. Std. Impact Subtotal	-9	-69	-69	-64	-58	-154	-166	-108	-99	-94
Alternative 4 - Total	**-50**	**-144**	**-119**	**-173**	**-138**	**-269**	**-248**	**-229**	**-181**	**-189**

Alternative 4 - Alternative 4 would impose the greatest administrative burden and generally has the highest environmental performance standards of all alternatives considered and analyzed in this EIS (Table E-4). For most mining and exploration on the public lands Alternative 4 would have a higher adverse effect than the other alternatives. For recreation and hobby activities this alternative received a relatively small negative score.

Both administrative and performance standards under Alternative 4 would have a moderate to high adverse effect. The administrative requirements with the greatest negative effect on mining under Alternative 4 include the Notice/Plan threshold, financial guarantees, claim validity, appeals process, and applying the new regulations to existing operations. The change to the Notice/Plan threshold would affect only operations that would be Notice-level operations under the existing regulations. The other provisions would harm operations regardless of size. Most all of the environmental performance standards would have a moderate to high adverse effect on at least some segment of the industry. Mandatory pit backfilling, for example, would have an extremely high negative effect on open pit mining. At the same time the backfilling provision would at most only slightly affect other forms of mineral activity.

MINE COST MODELS

Regulation changes generally affect the mining industry economically. Effects involve such environmental costs as permitting and reclamation, and the time value of money. To determine the costs of the effects of these regulations to the operator and to the mining industry, mine cost models were developed to estimate general costs of mining for analysis purposes. These models are theoretical and highly general in orders of magnitude. They do not represent any existing mines. They are for analysis purposes only to show a general economic impact of these regulations.

The following data and assumptions are used to develop these models.

1.The operating and capital costs were developed from reference models presented in *Mining Cost Services* (Western Mine Engineering, Inc. 1997), section CM, Cost Models.

A. The following items are included in operating and capital costs:

- All labor, material, supply, and equipment operation costs incurred at the mine or mill site, including supervision, administration, and onsite management
- Benefits and employment taxes
- All onsite development
- Mine and mill equipment and facilities, purchases, and installation or construction
- Limited haul road construction
- Engineering and construction management fees
- Working capital
- Tailings disposal

B. The following items are not included in operating and capital costs:

- Exploration

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- * Permitting and environmental analysis costs
- * Contingencies
- * Access roads, powerlines, pipelines, or railroads to the mine and mill site
- * Home office overhead
- * Taxes (except sales taxes)
- * Insurance
- * Depreciation
- * Townsite construction or operation
- * Offsite transportation of products
- * Incentive bonus premiums
- * Overtime labor costs
- * Sales expenses
- * Smelting and refining costs (except ore production at hydro metallurgical mills)
- * Interest expenses
- * Startup costs (except working capital)

2. Permitting, environmental, and reclamation costs are estimated from BLM experience in Nevada, Alaska, and Montana.

3. The equipment used to develop and extract ore from the mine will also be used in reclamation.

4. The costs of these regulations will be borne by the industry and not BLM. Costs are estimated for analysis purposes in these models.

5. Placer model costs are derived from Montana Placer Mining BMPs (best management practices) SP 106.

6. Time delays are not added to cost figures. It is assumed that operators will submit complete documents in a timely manner and that BLM will process projects on time. Time is given no monetary value.

7. Operators will comply with the regulations.

8. Acres disturbed are averages based on actual mine plans and notices submitted to BLM.

9. Costs for equipment were derived from *Rental Rate Blue Book* by K-III, *Mine and Mill Equipment Cost* by Western Mine Engineering, Inc. (1997a) and from bond calculations accepted by BLM.

10. Labor costs were derived from *Mining Cost Service* by Western Mine Engineering, Inc. (1997b), Davis and Bacon Wage Grade tables, and bond calculations accepted by BLM.

11. This analysis assumes that these costs will not be affected by regulation changes. Regulation changes for this analysis will affect permit authorizations and reclamation and closure aspects of mining.

12. Reclamation costs for this analysis include chemical stabilization, removal of equipment and structures, earth work, erosion and water controls, and revegetation.

13. Permit and environmental costs are averages obtained from the mining industry, environmental consultants, and BLM offices. These costs include all costs of preparing environmental documents under the National Environmental Policy Act, cultural work under the Archaeological Resources Protection Act, and other acts as required to permit operations under existing regulations.

14. Bond costs are based on BLM policy. No bonding is required for Notice-level operations. Exploration Plans of Operation are bonded at cost or $1,000/acre, whichever is lower. Mining Plans of Operations are bonded at 100% of the cost for closing and reclaiming mines that have used chemicals and cost of reclamation or $2,000/acre, whichever is lower.

15. Stream restoration costs were derived from the *Handbook for Reclamation of Placer Mined Stream Environments in Western Montana* (INTER-FLUVE, Inc. 1991), prepared for the U.S. Environmental Protection Agency. The "stream and floodplain reconstruction" was used as the cost figures in these models.

16. All operations are assumed to be economically viable.

17. The amount of material (topsoil, waste rock) has been estimated for analysis purposes. The estimates will be used from model to model to show estimated changes in cost.

18. The mine models do not spread costs through the years of the project but assume that the capital costs will be accrued in years 1 and 2, operating costs over the life of the project, reclamation costs in the last 2 years of the project, and environmental and permitting costs in the first year.

19. The cost of a validity exam will be used for the cost of conducting a feasibility study under Alternative 4.

As discussed above, the main areas of impacts to the industry are in reclamation and permit/ environmental compliance. To better understand these relationships, the following theoretical costs have been derived for the models above. These costs were used as a basis for estimating economic changes in mining.

The following assumptions and models were used to address the analysis of the impacts from the regulations. These models were developed for comparison and *theoretical* purposes and will be used only for that purpose.

Exploration Model

This operation is run by a medium-sized exploration company that owns its equipment or rents all of its equipment. This operation will have no major capital costs. The model assumes the exploration is for precious or base metals.

Project size:	4 acres disturbed
Project life:	Less than 6 months
Proposed evaluation methods:	Drilling (50 holes) and trenches (5) @ 100'x5'x0'
Equipment:	Truck-mounted self-contained drills, tracked excavator (Cat 231D), dozer (Cat D7H)
Permitting:	Notice-level, 15 days to complete; no federal/state joint coordination needed. Note: This operation could require a Plan of Operations depending on alternative or whether the operation is located on sensitive lands.
Reclamation:	Recontouring and revegetation, stream restoration, immediately after completion of drill hole/trenching evaluation.

Permitting and Environmental Costs

Permitting and environmental costs are difficult to determine by a generalized method. The costs of permit authorizations and environmental documentation vary greatly because of site-specific conditions. Depending on the ore body sought, its location, and other local environmental conditions, the costs can cover a broad range. For the following costs, several mining companies and consultant firms were contacted, and average costs were derived. These costs are described below and are detailed in Table E-6.

This exploration operation would file a Notice, and no bond or environmental documents would be required. All actions would be handled by the local BLM office with which the Notice is filed. The only cost to the operator would be to prepare the document to be submitted to BLM. Two people would need 3 days with AutoCAD support to complete the documentation for the Notice, at a cost of $1,000.

Reclamation Costs

Earthwork would include ripping all roads and drill pads, recontouring roads and pads, and plugging drill holes. The work would take 20 hours to complete. Each piece of equipment would operate for 10 hours. The 50 dry drill holes, 200 feet deep, would be backfilled with drill cuttings. This work would take one operator an extra half hour to complete. Equipment needs include a bulldozer and a tracked excavator at a cost of $2,200. Labor costs are estimated to total $1,600 for two equipment operators. Drill hole plugging is estimated to result in additional labor costs of $100. For revegetation, no ground preparation is needed for seeding. The model assumes that the project is completed during good seeding times of the year. The seed mixture would be a combination of native and exotic plants as outlined in the open pit model. The priority is to stabilize the soil. An estimated 4 hours would be needed for seeding. Because of the nature of this operation, chemical stabilization and removal of structures would not be needed.

Table E-6. Exploration Model Costs

Description of Activity	Cost Item	Unit Cost	Total Cost
Permitting (Notice Preparation)	2 people, 3 days each	$500 ea	**$1,000**
Exploration Activity:			
Operating Cost - Labor			50,000
Operating Cost - Equipment			150,000
Exploration Activity Total			**200,000**
Reclamation:			
Earthwork			
Equipment	1 dozer (Cat D7H) - 10 hrs	120/hr	1,200
	1 tracked excavator (Cat 231D) - 10 hrs	100/hr	1,000
Labor	2 equipment operators, 20 hrs each	40/hr each	1,600
Drill holes (50)	1 operator, 2.5 hrs	40/hr	100
Revegetation			
Seed Mixture	4 acres	56/ac	225
Labor	1 laborer, 4 hrs	28/hr	112
Miscellaneous			
Mob/Demob	2 vehicles	500/vehicle	1,000
Supervision			
Equipment	½ ton 4X4 pickup, 1 day	40/day	40
Labor	environmental manager, 8 hours	25/hr	160
Reclamation Total			**5,437**
Total Cost of Exploration Project			**$207,337**

Miscellaneous Costs

The equipment to complete reclamation is assumed not to be located at the site. Therefore, mobilizing and demobilizing the equipment would involve more costs to industry. The operation usually would require 8 hours of supervision (employed by the company) to ensure that reclamation is completed correctly.

Alternative 1 - Current Management

Costs would not change under Alternative 1 since the regulations would not change.

Alternative 2 - State Management

Alternative 2 is based on individual states taking over the surface management of mining on public lands. Estimating costs for this alternative for each of the 12 states in the study area would be impractical for this exercise. Therefore, the following cost calculations assume that the state program is based on current BLM regulations, with a few differences. A review of state programs found that most states appear to be similar in posting bonds for reclamation and in reclamation and surface and ground water requirements. States appear generally not to review operations smaller than 5 acres but to require reclamation. The states do not generally review documents for such matters as cultural resources, cave resources, and wildlife.

This analysis assumes that the state will not require any information to be submitted because the project occupies less than 5 acres. The state will still require reclamation and monitor the activity area for compliance.

Permitting and Environmental Costs. The operator would not have to submit a Notice to BLM and usually would not have to submit anything to the state. The operator would therefore save the direct cost of document preparation. An operator making project changes would save time by not having to contact BLM. By not having to prepare a Notice, the operator would save about $1,000 (assuming Notice preparation would take two people 3 days to complete).

Reclamation Costs. This analysis assumes that the state requires reclamation. The company would have to reclaim any disturbance from its operation. The analysis also assumes that reclamation would not require restoring wildlife and fisheries habitat. For exploration operations this restoration could be represented by the types of seed mixtures used. The analysis assumes that the state will require only grasses to stabilize soils. Using the seed mixture in the open pit model and using only the grasses in the mixture would bring the cost to only $28/acre instead of $56/acre. A total of $112 would be saved on revegetation costs (assuming per-acre savings of $28 for seed mixture).

Total Estimated Cost Changes. Total cost savings for this exploration project under Alternative 2 are summarized in Table E-7.

Table E-7. Alternative 2: Changes in Costs for Small Exploration Project

Total Project Cost under Alternative 1 (Existing regulations)	$207,337
Change in Costs under Alternative 2 due to	
Elimination of Notice preparation	(1,000)
Change in Seed Mixture	(112)
Total Change in Costs under Alternative 2	(1,112)
Total Project Cost under Alternative 2 (State Management)	$206,225
Percent Change in Costs from Alternative 1 to Alternative 2	- 1 %

405

Alternative 3 - Proposed Action

Alternative 3 would establish outcome-based performance standards. This approach outlines to the industry what standards must be met on public lands but lets mine operators determine how to meet these standards. Impacts to exploration would be slight because BLM and industry are already generally following these procedures in authorizing operations and accepting reclamation. Industry will have no costs for paying penalties.

Any operation within a mineral withdrawal area would have the extra cost of time and money for completing a validity exam of mining claims. These types of actions would not occur often and are assumed for this model to be addressed as no cost.

Under the Proposed Action, the most significant potential change would be the possibility that this Notice-level operation would now be required to submit a Plan of Operations.

Permitting and Environmental Costs. The greater cost under the Proposed Action would mainly be the cost of bonding a Notice. Other costs could result from operations being in areas now being classified as sensitive or, under the Forest Service option of Alternative 3, being classified as sensitive and being required to submit a Plan of Operations.

Bonding. Bonding would be strengthened to include bonding of Notices at 100% of the reclamation cost or $1,000/acre or portion thereof, whichever is higher. Plans of Operations would be bonded at 100% of the reclamation cost or $2,000/acre or portion thereof, whichever is higher. Bonding would be used to pay for site reclamation if operators cannot fulfill their reclamation obligations. This model assumes that the operator is obtaining the bond from a bonding agency and would pay only a certain percentage for the bond amount. Total amount of the bond is estimated to be $106, or 2% of reclamation costs ($5,437 @ 2% = $106).

Notice Versus Plan Threshold. Under the Proposed Action, requirements for when Plans of Operations or Notices must be filed would be strengthened. More categories of exploration would need Plans of Operations than before. For example, any use of chemical leach processing would require a Plan of Operations, whereas now an operation disturbing fewer than 5 acres a year requires only a Notice. If the Forest Service option is used, the number of Notices could be small because of the reasonable aspects of environmental concerns. Notices would be used mostly for exploration and small mines that do not use chemicals onsite.

Estimated costs for an exploration project that would be required to file a Plan of Operations would total about $82,500 ($2,500 for preparing a Plan of Operations and $80,000 for preparing an environmental assessment of small complexity, with costs borne by the operator).

Processing Content. Alternative 3 could delay and increase costs for exploration projects having short turnaround times. The model assumes that the Proposed Action would result in no costs of delay if industry plans reasonably well and BLM's processing of the Notice is timely. Time delays of from 15 to 30 days for approval should not increase costs. But problems could result if delays are not scheduled and the operation assumes the cost of standby time for drill rigs and workers. BLM's late processing of permits could also add to this cost. No time for drill rigs and workers. BLM's late processing of permits could also add to this cost. No delays are assumed for this model.

Validity Exams. This provision requires that BLM conduct a validity exam before approving a Plan of Operations within an area withdrawn from the mining laws. These operations are statistically few but exist on the public lands. The major concern for industry is the delay of processing the exam. The companies would not usually pay for the mineral exam but must support the mineral examiner in preparing the report. The average cost to BLM of conducting a validity exam is about $10,000. BLM would recover the cost of the validity exam from the operator. Few operations would be subject to validity exams; only 2% of mining activities are assumed to require this additional cost.

Reclamation Costs. No additional reclamation costs would be required under Alternative 3.

Total Estimated Cost Changes. If the exploration operation is in an area that has not been withdrawn from the mining laws and does not require a Plan of Operations, the exploration company would bear no additional cost with proper coordination. But if the project needs to submit a Plan of Operations and the area of exploration has been withdrawn from mineral entry, the operator would have to pay for a third-party environmental assessment (EA), and a validity exam would be required before operations could begin. Estimated cost changes are summarized in the Table E-8.

Table E-8. Alternative 3: Change in Costs for Small Exploration Project

Total Project Cost under Alternative 3	$207,337
Change in Costs under Alternative 3 due to Bonding Total Change in Costs under Alternative 3	106 106
Total Project Costs under Alternative 3	207,483
Percent Change in Costs from Alternative 1 to Alternative 3	0%
Change in Costs Assuming Plan of Operations Required and Validity Exam is Conducted	
Change in Costs under Alternative 3 due to Bonding Plan Preparation Environmental Assessment Validity Exam Total Change in Costs under Alternative 3	 106 2,500 80,000 10,000 92,606
Total Project Costs under Alternative 3	$299,943
Percent Change in Costs from Alternative 1 to Alternative 3	+ 31%

Alternative 4: Maximum Protection

Alternative 4 is based on design standards that establish specific criteria for protecting environmental resources. These types of standards and criteria would affect exploration inspection, and enforcement; soil stability; topsoil; drill hole plugging; and revegetation. The need for a validity exam, bonding criteria, fish and wildlife habitat, and wetlands would affect exploration.

This model assumes that the operator would comply with the regulations and therefore pay no penalties. The automatic stay for appeals under Alternative 4 could delay exploration as well as potential future profits if an economic deposit is discovered. For this model costs of delay were not analyzed, but under Alternative 4 these costs might exist.

Permitting and Environmental Costs. The standards for road construction were developed for well-maintained roads and not for exploration roads. It is assumed that road building will be based on site conditions.

Bonding. Bonding would be as outlined for Alternative 3 but would include more costs for unplanned events (spills, releases, and cleanup). For exploration projects additional costs for major environmental problems would probably not need to be addressed except for potential petroleum spills. Any petroleum spill would require removing contaminated soils and trucking them to an approved disposal site for treatment. The potential cost would be added to the bond amount. The exploration model assumes that the operator would place the full amount of the bond into a certified deposit. The operator would again get a bond through a bonding company. If the operator can get good company ratings, the bond will cost 2% of the bond amount for 1 year. The total estimated bond amount would be $6,437, and the estimated cost of reclamation would amount to $5,437 for general reclamation as described in Alternative 3, plus $1,000 more for a potential unplanned petroleum spill. The total bond cost is estimated to be $129, or 2% of reclamation costs ($6,437 @ 2% = $129).

Notice Versus Plan Threshold. Under Alternative 4 Notices and all mining activity, including exploration, would be replaced by Plans of Operations. The cost of developing and reviewing Plans would apply as outlined for Alternative 3. Estimated costs for an exploration project to file a Plan of Operations would total about $82,500 ($2,500 for preparing a Plan of Operations and $80,000 for preparing an environmental assessment of small complexity, with costs borne by the operator).

Inspections. Under Alternative 4 operators would be required to hire third-party contractors to monitor their operations. This project would require three inspections: once during exploration, once during reclamation, and once for final reclamation and clearance. The monitoring would not require an overnight stay, but 10 hours would be needed to get to the site, complete the inspection, and return to the office and complete the report. No samples would be needed for this program. Total estimated costs for inspection would amount to $1,500 (assuming 1 inspector, 3 trips, 10 hours/trip, at $50/hr).

Validity Exams. This provision requires that a validity exam be conducted before a Plan of Operations is approved. This cost would remain the same as outlined for Alternative 3. The average cost to BLM of conducting a validity exam is about $10,000. BLM would recover the cost of the validity exam from the operator.

Reclamation Costs. Reclamation for wetlands and fish and wildlife habitat would remain the same for this model as under Alternative 1, No Action. The assumption is that the mining industry overall would be diligent and disturbances would be reclaimed within the 10-year limit. Therefore, no other habitat restoration would be required, and no more costs are assumed.

This is a short-term exploration project, and soil stability design limits would not be approached because of reclamation. Any steep slopes could have some erosion control problems, but no additional cost of erosion control blankets would be needed above erosion and sediment control structures.

Water Resources. For the exploration model 50 drill holes will be drilled with a diameter of 5.5 inches. This holes are assumed to be dry. Under Alternative 4 the holes would be plugged with bentonite and 10 feet of cement. Total estimated cement capping costs would amount to $1,250 (assuming 50 holes, 10 feet/hole, at $2.50/linear foot). Total estimated plugging costs would amount to $16,150 (assuming 190 feet/hole, at $1.70/linear foot).

Topsoil. Under Alternative 4 the topsoil would be removed by soil horizons. The operator would remove the topsoil the same as under the other alternatives, but possible increases in travel time to stockpile locations could decrease the efficiency of the earth moving equipment by not allowing the blade to take as deep a cut as possible. These increases would not substantially increase the time needed to remove topsoil.

Under the other alternatives the soil and colluvium would be moved by the earth moving equipment in one or two passes, mixing the material together. The material would be removed to different locations on either side of the road or drill pads. The travel distance would remain the same, but the efficiencies of the equipment would decrease. The efficiencies were estimated from the *Caterpillar Performance Handbook* (Caterpillar, Inc. 1996) as 0.83. For Alternative 4 the efficiency is estimated at 0.75 or about 1 hour difference in the time needed to complete the dirt work. Total estimated additional costs for equipment and labor to complete dirt work is $300 (assuming an additional hour each for one dozer at $120/hr and one tracked excavator at $100/hour, and two equipment operators for 1 hour each at $40/hr).

Revegetation. Under Alternative 4 revegetation would consist of only native species seed planted. The open pit model outlines the seed mixture used under this alternative. All other aspects of seeding the exploration project would remain the same as under Alternative 1 (No Action). Total estimated additional costs would be $155 (assuming an additional seed mixture cost of about $39/acre for 4 acres).

Total Estimated Cost Changes. If the exploration operation is not in an area withdrawn for minerals, the project would incur the costs shown in Table E-9.

Table E-9. Alternative 4: Change in Costs for Small Exploration Project	
Total Project Cost under Alternative 4:	$207,337
Change in Costs under Alternative 4 due to:	
Bonding	129
Plan Preparation	2,500
Environmental Assessment	80,000
Third-Party Monitoring	1,500
Drill hole Plugging	17,400
Topsoil Management	300
Revegetation with Natives	155
Validity Exam	10,000
Total Change in Costs under Alternative 4:	111,984
Total Project Costs under Alternative 4:	$319,321
Percent Change in Costs from Alternative 1 to Alternative 4:	+ 35%

Placer Model

The placer operation would be conducted by a medium-size mining company. The model assumes the operation is for precious metals, gold. The operation would disturb 1 mile of stream, including the stream channel and uplands. No mercury would be used onsite.

Resource size:	1,000,000 bcy
Production rate:	500 lcy per day
Mine life:	10+ years
Average grade:	$4 per bcy @ $300/oz.
Overburden:	< 14 feet
Pay gravel:	<4 feet
Equipment used:	Dozer (D8), Excavator (235), mobile washplant (hopper, vibrating screen, 4' x 30' single sluice, 1200 g.p.m. water use)
Crew:	3 workers
Camp:	one-site small trailers and temporary sheds
Fuel storage:	1,000 gallons in portable tanks with spill containment, bio- treatment facility onsite
Permitting:	Environmental assessment completed, 2 months to complete, joint state coordination
Reclamation:	Recontouring and revegetation, stream restoration, concurrent with mining

Note: This operation would require some recontouring of the waste rock. The waste piles would be both in the old part of the pit and out of the pit at a 2:1 slope.

Permitting and Environmental Costs. Permitting and environmental costs are hard to determine in a generalized way. The costs of permit authorizations and environmental documentation greatly vary with site-specific conditions. Depending on the ore body and its location and other local environmental conditions, the cost can cover a board range. For the following costs several mining companies and consultant firms were contacted. These costs are averaged and are shown in Table E-10.

Plans of Operations. The operation would be filed under a Plan of Operations. The operator would pay for the environmental analysis, which would include a wetlands study, steam restoration/reclamation plan, cultural survey, and a wildlife/fisheries field study.

Bonding. The model assumes that the operator is buying from an agency an annuity bond, for which the operator would pay an insurance premium, which would cost an estimated 2% of the bond amount per year. The model further assumes that the operator has a good credit rating and has the assets to back the bond. The bond would be for reclaiming the site at $2,000/acre or for $24,000. The bond would be assessed at 2% for 10 years and would cost $2,400.

Reclamation Cost Estimation. Placer mining is a form or strip mining that usually operates within stream channels. The area would be recontoured concurrently with the production of the gravels. The overall size of the operation would be 12 acres, but at the end of the operation only 6 acres should be reclaimed. The operation would require more reclamation for repairing any stream channels and restoring habitat. The mine would include sediment ponds and other sediment and control structures.

Stream Restoration. There are very few references for the costs of stream restoration. This model used published data from EPA's *Handbook for Reclamation of Placer Mined Stream Environments in Western Montana* (INTER-FLUVE, Inc. 1991). The figures listed in this document are assumed to cover regrading and stream recontouring, topsoil placement, revegetation, and wildlife work. Topsoil is required only on the floodplain and would not be spread in the channel. Seeds would be broadcast by hand. Stream restoration would include establishing vegetation, reconstruction, and building structures for habitat. The channel dimensions would be 2 feet deep by 8 feet wide by 1 mile long at a 3% slope.

The documentation for reclamation shows several costs, depending on the type of work completed. Table 12 of EPA's *Handbook for Reclamation of Placer Mined Stream Environments in Western Montana* (INTER-FLUVE, Inc. 1991) shows the cost of stream and floodplain reconstruction to be $7 to $17/foot. This model assumes $10/ft for wildlife and fish restoration.

Chemical Stabilization. The mine would use no chemicals that involve closure issues. Sediments would be reclaimed during recontouring.

Structure Removal. Structure removal would consist mainly of removing process buildings, office trailers, maintenance shop, and high-density polyethylene (HDPE) pipelines used by the project. The model assumes that three workers would take 10 days to remove the facilities. The complete operation is portable and can be easily transported.

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Table E-10. Placer Model Costs			
Description of Activity	Cost Item	Unit Cost	Total Cost
Permitting			
Plan Preparation	Two People 5 Days with Computer Support		2,500
EA preparation			80,000
	Includes Wetlands study	5,000	
	Restoration/reclamation plan	5,000	
	Wildlife/fisheries studies	10,000	
	Cultural survey	10,000	
	Bond Cost	2% for 10 yrs	2,400
Permitting Total			**84,900**
Placer Mining Activity:			
Capital Cost			250,000
Operating Cost - Labor			425,000
Operating Cost - Equipment			300,000
Exploration Activity Total			**$975,000**
Reclamation:			
Stream Restoration	Based on EPA Reference	10/foot	52,800
Structural removal			
Equipment	2.5 Ton Truck for 10 Days	60/day	600
	1 Tracked Excavator (Cat 231d) -20 Hrs	100/hr	2000
Mob/Demob	2 Vehicle	500	1000
Labor	3 Person Crew for 10 Days at 10 Hours/day	27/hr	8,100
Reclamation Total			**64,500**
Total Cost of Placer Project			**$1,124,400**

Alternative 1: No Action

Costs would not change under Alternative 1 because the regulations would not change.

Alternative 2: State Management

Alternative 2 is based on the states taking over the surface management of mining on public lands. Determining costs for this alternative for all of the states involved in mining would not be practical for this exercise. Therefore, the following cost calculations would be based on the assumptions that the state program would based on current BLM regulations. A review of the state programs reveals that they are similar in posting bonds for reclamation and in surface water, ground water, and reclamation requirements.

This analysis assumes that the state would require a Plan of Operations, reclamation, the posting of bond, and monitoring for compliance, but no environmental review for such aspects of the project as cultural resources, cave resources, and wildlife.

Permitting and Environmental Costs.

Plan of Operations Preparation. The operator would have to submit a Plan to the state but not to BLM. The operator would still produce a Plan of Operations, but the plan would not be subject to environmental review, and the operator would not have to pay for an environmental assessment.

Reclamation Costs.

Stream Restoration. This analysis assumes that the state would require reclamation. The company would have to reclaim any disturbance resulting from their operation, but reclamation would not require restoring wildlife and fisheries habitat.

The documentation for restoration shows several costs, depending on the type of work completed. Table 12 in EPA's *Handbook for Reclamation of Placer Mined Stream Environments in Western Montana* (INTER-FLUVE, Inc. 1991) shows stream and floodplain reconstruction to be $7 to 17/foot. Assuming that wildlife and fisheries habitat would not be restored, the cost would be $7/foot.

Total Estimated Cost Changes. Total cost savings for this Placer project under Alternative 2 are summarized in Table E-11.

Table E-11. Alternative 2 -- Changes in Costs for Placer Project

Total Project Cost under Alternative 1 (Existing Regulations)	$1,124,400
Change in Costs under Alternative 2 Due to	
Elimination of Environmental Review	(80,000)
Change in Stream Restoration Cost	(15,840)
Total Change in Costs under Alternative 2	(95,840)
Total Project Cost under Alternative 2 (State Management)	$1,028,560
Percent Change in Costs from Alternative 1 to Alternative 2	- 1 %

Alternative 3: Proposed Action

Impacts to the industry would be minimal because BLM and industry are generally following these procedures in authorizing operations and accepting final closure and reclamation.

Under the Proposed Action the soil stability design limit would not be approached because of reclamation. Any steep slopes could have some erosion control problems, but the model assumes that no additional cost of erosion control blankets would be needed above erosion and sediment control structures.

Under the Proposed Action, bonding and a potential validity exam would add cost to the Placer Mine model. Other reclamation costs would be needed to complete the requirements of higher wildlife and wetland standards.

Permitting and Environmental Cost.

Bonding. The Proposed Action would strengthen bonding to include the bonding of Plans at 100% of reclamation cost. Bonding would be used to reclaim sites if operators could not complete their reclamation obligations. The bond amount would change to cover the estimated cost to reclaim the operation. This model assumes that the operator is buying an annuity bond, for which operators would pay insurance premiums that would cost an estimated 2% of the bond amount.

Validity Exams. The Proposed Action would require BLM to conduct a validity exam before approving a Plan of Operations for an area withdrawn from the mining laws. These costs would remain the same as outlined for exploration under the Proposed Action.

Reclamation Cost.

Stream Restoration. Table 12 of the EPA's *Handbook for Reclamation of Placer Mined Stream Environments in Western Montana* (INTER-FLUVE, Inc. 1991) shows stream and floodplain reconstruction costs to range from $7 to 17/foot. For the Proposed Action the analysis assumes $17/ft for meeting the wildlife and fish restoration standards. Meeting these standards would result in an additional cost to the operator of $36,900.

Total Estimated Cost Changes. Estimated cost changes are summarized in the Table E-12.

Table E-12. Alternative 3 -- Change in Costs for Placer Project

Total Project Cost under Alternative 3	$1,124,400
Change in Costs under Alternative 3 due to Bonding	10,000
Change in Costs under Alternative 3 due to Reclamation	36,900
Total Change in Costs under Alternative 3	46,900
Total Project Costs under Alternative 3	1,171,300
Percent Change in Costs from Alternative 1 to Alternative 3	+4%
Change in Costs Assuming Validity Exam is Conducted	
Change in Costs under Alternative 3 due to Validity Exam	10,000
Total Project Costs under Alternative 3	$1,174,100
Percent Change in Costs from Alternative 1 to Alternative 3	+ 5%

lternative 4: Maximum Protection

These type of standards and criteria under Alternative 4 would affect placer mining. Bonding, inspection and enforcement, replacing topsoil, protecting fish and wildlife habitat and wetlands, and revegetation would directly affect placer mining.

The automatic stay for appeals under Alternative 4 would delay placer mining and result in the costs of lost time and the delay of potential future profits. For this model, costs to industry were not analyzed, but these costs would exist under Alternative 4.

The soil stability design limit would not be approached because of reclamation. Any steep slopes could have some erosion control problems, but this model assumes that no additional costs would be needed for erosion control blankets above erosion and sediment control structures.

Permitting and Environmental Costs.

Bonding. Bonding would be as outlined for Alternative 3 but would include extra money for major environmental events. For placer projects other than petroleum spills, added costs would not need to be addressed for major environmental problems. Any petroleum spill would require removing the contaminated soils and trucking them to an approved disposal site for treatment. No other chemicals are expected to be used onsite.

For Alternative 4 the model assumes that the operator will build an oil treatment facility onsite to handle all spills from the operation. It is also assumed that the operator will purchase an annuity bond from an agency, paying an insurance premium that would cost an estimated 2% of the bond amount. This amount would be the same as under Alternative 3.

Inspections. Under Alternative 4 operators would have to hire third-party contractors quarterly to monitor their operations. The contractor would complete the inspection and prepare the report in a 10-hour day but would not take environmental samples. The contractor would conduct the monitoring program for the 10 years of the mine operation at an average salary of $50/hour.

Validity Exams. Alternative 4 would require BLM to conduct a validity exam before approving a Plan of Operations.

Reclamation Costs.

Stream Restoration. Because of Alternative 4's needs to set design standards, the restoration of riparian areas would be extensive. The handling of topsoil would require more time because of the loss in equipment efficiency. Revegetation would require use of native species, and the wetlands would have to be in properly functioning condition within 10 years. The model assumes that both the stream and the uplands would be disturbed. For riparian areas and wetlands to reach properly functioning condition and to meet wildlife and fishery habitat needs, more restoration would be required.

EPA's *Handbook for Reclamation of Placer Mined Stream Environments in Western Montana* (INTER-FLUVE, Inc. 1991) shows that the cost of restoring a stream and upland areas can vary greatly. The cost of total stream and floodplain reconstruction with fisheries can cost from $28 to $47/foot. For Alternative 4 the model assumes that total stream and floodplain restoration would be needed and that restoration would cost $28/foot, an amount that includes restoring fisheries to meet the 10-year requirement for properly functioning condition for riparian lands and fisheries use.

Total Estimated Cost Changes. If the exploration operation is not within an area withdrawn from the mining laws, the project would incur the costs shown in Table E-13.

Table E-13. Alternative 4 -- Change in Costs for Placer Project

Total Project Cost under Alternative 4:	$1,124,400
Change in Costs under Alternative 4 due to:	
Stream Restoration	110,880
Third-Party Monitoring	20,000
Bond	10,000
Validity Exam	10,000
Total Change in Costs under Alternative 4	150,880
Total Project Costs under Alternative 4	1,275,280
Percent Change in Costs from Alternative 1 to Alternative 4	+ 13%

Strip Mining Model

This strip mine is being operated by a medium-sized industrial mineral organization. This mine is the organization's main source and directly supplies an operating mill and production facility. This model is organized after a gypsum operation.

Resource size:	1 million tons
Production rate:	250 tons per day
Mine life:	10+ years
Overburden:	4 feet, no waste rock expected
Pay layer:	4 feet
Equipment used:	Dozer (D8), excavator (235), front-end loaders, rear dump trucks, road graders, percussion drill, stationary washplant (hopper, vibrating screen, concentration/flotation mill, 1200 gpm water use)
Crew:	15 workers
Housing:	nearby towns
Fuel:	5,000 gallons in portable tanks
Permitting:	Environmental assessment completed, 3 months to complete, joint state-federal coordination
Reclamation:	Recontouring and revegetation concurrent with mining

Note: This model assumes an industrial mineral and little overburden that is not reclaimed in the strip mining process and that a petroleum biotreatment facility is onsite for cleaning up petroleum spills. A construction waste landfill is also onsite.

Permitting and Environmental Cost

Permitting and Environmental costs are hard to determine by a generalized method. The cost of permit authorizations and environmental documentation greatly vary by site-specific conditions. Depending on the ore body and its location and other local environmental conditions, the cost can cover a broad range. The following costs were derived from information obtained from several mining companies and consultant firms. These costs were averaged and are described below.

Processing Cost. The operation would file a Plan of Operations. The operator would pay for the environmental analysis, which would include a wetlands study, steam restoration/ reclamation plan, cultural survey, and a wildlife/fisheries field study.

Bonding. This model assumes that the operator is purchasing an annuity bond for which it would pay an annual insurance premium of 2% per year for 10 years. The model further assumes that the operator has a good credit rating and has the assets to back up the bond. The bond amount for this project is $24,000.

Reclamation Cost

Earthwork. The model assumes that strip mining methods are used to extract most industrial minerals even though strip mining is only one of several ways industrial minerals are mined. The basic model is for bentonite- and gypsum-type deposits. No chemicals would be used to process the material, and the material's final processing is off site. The earthwork would consist of recontouring and covering with topsoil the roads, ancillary facilities, and the last strip pit. Strip mining applies ongoing concurrent reclamation, with each mined strip being refilled with the waste rock from the next pit and covered with topsoil. The calculations, therefore, address only the final phase of earth work and revegetation for the operation.

Cost of regrading.

Production rate
- Equipment = D9N. and U Blade
- Average dozing distance = 270 ft
- Production = 300 yd^3/hr

Correction factors
- Operator average = 0.75
- Material - loose stockpile/.ripped or blasted = 1.20 or .08
- Type dozing - slot to side by side = 1.20
- Job efficiency = 0.83
- Weight correction = 0.83

Hourly Production rate = 223 yd^3/hr

Cost Rates

Bulldozing (D9N) = $155/hr

Operator = $40/hr

Using the above data, the following table estimates equipment and labor costs for regrading.

	Acres	Cubic Yards	Hours	Equipment Cost	Labor Cost
Waste Rock	10	1,200	54	$18,390	$2,160
Roads*	40	10,000	448	$69,440	$17,920
Ancillary Facilities	15	15,000	67	$19,385	$2,680
Cost of Recontouring				$107,215	$22,760

*Assumption that ripping production is the same as blading work.

Cost of Applying Top Soil. Apply growth medium to an average thickness of 6 inches, using a scraper.

Production rate

Equipment = 615 Scraper

Capacity = 16 yd^3

Average haul distance = 1000 ft

Cycle time

Cycles per hour = 13.33 cycles per minute

Correction factors

Load factor = 0.9

Job efficiency = 0.83

Eff. Load capacity = 14.4 yd^3

Hourly production= 159.4 yd^3/hr

Cost Rates

615 scraper = $100/hr

Operator = $ 40/hr

From the above data, the following table estimates equipment and labor costs for applying topsoil.

	Acres	Cubic yards	Hours	Equipment cost	Labor cost
Waste Rock	10	24,200	152	$15,200	$6,080
Roads	40	96,800	608	60,800	24,320
Ancillary Facilities	15	36,300	228	22,800	9,620
Cost of applying topsoil				$98,800	40,020

Revegetation. Revegetation would require scarifying and preparing the ground for seeding. Seeds would be planted with drill seeding equipment. Aspects of wildlife habitat enhancement and wetland reclamation would be included in revegetation.

Production rates

Equipment = 14-G grader with scarifier
Scarifying width = 10 feet
Operating speed = 1.0 mph
Production rate = 1.0 hr/ac
Equipment = Small tractor and seed drill
Seeding width = 10 feet
Operating speed = 2.5 mph
Production rate = 0.33 hr/ac
Travel length = 4356 ft/ac

Cost rates

Tractor and seed drill = $50/hr
14-G Grader = $80/hr
Operator - grader = $40/hr
Labor (2) = $27/ac

Seed Mixture

Species	$/lb (PLS)	Drilled rate (lbs.)	Price/ac
Slender Wheatgrass	$1.25/lb	3	$3.75
Western Wheatgrass	$3.00/lb	2	$6.00
Fourwing Saltbrush	$8.00/lb	1	$8.00
Yellow Sweetclover	$0.60/lb	0.5	$0.30
Basin Wildrye	$5.60/lb	1	$5.60
Shadscale	$6.50/lb	2	$13.00
Small Burnett	$0.90/lb	2	$1.80
Thickspike Wheatgrass	$8.25/lb	0.5	$4.15
Prostrate Kochia	$17.50/lb	0.25	$4.40
Sainfoin	$1.40/lb	2	$2.80
Sandberg Bluegrass	$26.00/lb	0.25	$13.00/ac
		Total	$56.30/ac

Using the above data, the following table estimates equipment and labor costs for revegetation.

	Acres	Hours	Equipment Cost ($)	Labor Cost ($)
Waste Rock	10	10 hrs grader	800	400
		3 hrs drill	150	162
			563	
Roads	40	40 hrs	3,200	1,600
		13 hrs	650	202
			2,252	
Ancillary Facilities	15	15 hrs	1,200	600
		5 hrs	250	270
			844	
Revegetation Cost			9,909	3,234

Removal of structures. Structure removal would consist mainly of removing process buildings, office trailers, maintenance shops, and high-density polyethylene pipelines used by the project. The model assumes that five workers would take 30 days to remove the facilities and bury the foundations.

Table E-14. Strip Mine Model Costs

Description of Activity	Cost Item	Unit Cost	Total Cost
Permitting			
Plan Preparation	Two people five days, w/ computer support		$2,500
EA Preparation			$80,000
	Includes: Wetlands study	$5,000	
	Restoration and reclamation	$5,000	
	Wildlife/fisheries studies	$10,000	
	Cultural survey	$10,000	
Bond Cost	Estimated bond $24,000	2% for 10 yrs	$2,400
Permitting Total			**$84,900**
Open Pit Operation:			
Capital Cost			$400,000
Operating Cost - Labor			$1,800,000
Operating Cost - Equipment			$240,000
Exploration Activity Total			**$2,440,000**

Reclamation:			
Earth Work			
Regrading			
Equipment*:	D9N Dozer	$155/hr	$107,000
Labor*:	operator	$40/hr	$22,760
Applying top soil			
Equipment*:	615 Scraper	$100/hr	$98,800
Labor*:	operator	$40/hr	$40,080
Revegetation			
Equipment*	: 14-G Grader	$80/hr	
	Small Tractor and seed drill	$50/hr	$10,000
	Seed mixture	$56.30/ac	
Labor*:	Grader operator	$40/hr	
	2 laborers	$27/hr	$3,234
Total earth work and revegetation			*$282,000*
Structural removal	2.5 ton truck for 80 days	$60/day	
Equipment	Ho-lift equipment, 24ft boom-7.7mt lift	$165/day	
	D9N Dozer for 2 days	$155/hr	$7,370
Labor	5 person crew for 80 days at 8 hours/day	$27/hr	$32,400
Total Structural removal			*$39,770*
Reclamation Total			**$321,800**
Total Cost of Open Pit Project			**$2,846,700**

*See estimated time to complete task in the information above.

Alternative 2: State Management

Determining the costs of the State Management Alternative for all of the states in the EIS study area would not be practical for this exercise. Therefore, the following cost calculations assume that the state program is based on current BLM regulations. A review of the state programs reveals that they are similar in requirements for posting bond for reclamation, surface and ground water, and reclamation.

This analysis assumes that the state would require that a plan of operations be submitted. The state would still require reclamation, the posting of bond, and monitoring for compliance. The analysis further assumes that no environmental review of the project would be required for cultural resources, cave resources, or wildlife.

Permitting and Environmental Cost.

Processing Cost. The operator would have to submit a plan of operations to the state but not to BLM. The project would not undergo environmental review, and the operator would not have to pay for an environmental assessment.

Reclamation Cost. The state requires reclamation. The company would have to reclaim any disturbance caused by the operation.

Reflecting general state programs, reclamation is required for soil and slope stabilization only. Therefore, this analysis assumes that the state would require only grasses for soil stability and that wildlife and fisheries habitat would not have to be restored.

The seed mixture under Alternative 2 would contain the following grasses:

Seed Mixture.

Species	$/lb (PLS)	Drilled rate	Price/ac
Slender Wheatgrass	$1.25/lb	3 lbs	$3.75/ac
Western Wheatgrass	$3.00/lb	2 lbs	$6.00/ac
Basin Wildrye	$5.60/lb	1 lb	$5.60/ac
Thickspike Wheatgrass	$8.25/lb	0.5 lb	$4.15/ac
Sandberg Bluegrass	$26.00/lb	0.25 lb	
			$13.00/ac
		Total	$32.50/ac

The following cost calculations show the cost for the seed mixture under Alternative 2.

Waste Rock	10 acres		325.00
Roads	40 acres		1,300.00
Ancillary Facilities	15 acres		487.50
		Total	$2,112.50

Total Estimated Cost Changes. Total cost savings for this strip mine project under Alternative 2 are summarized in Table E-15.

Table E-15. Alternative 2 -- Changes in Costs for a Strip Mine Project

Total Project Cost under Alternative 1 (Existing regulations)	$2,846,700
Change in Costs under Alternative 2 due to Elimination of Environmental review	(80,000)
Change in Seed cost	(1,500)
Total Change in Costs under Alternative 2	(81,500)
Total Project Cost under Alternative 2 (State Management)	$2,765,200
Percent Change in Costs from Alternative 1 to Alternative 2	- 3 %

Alternative 3: Proposed Action

Under the Proposed Action more costs would be required because of bonding and common variety determination. Impacts to the industry, however, would be minimal because BLM and industry are generally following these procedures in authorizing operations and accepting final closure and reclamation.

Any operation within a mineral withdrawal area would have the additional cost in time and money to complete a validity exam of the claims. These types of actions, however, would not occur often and for this model are assumed to involve no cost.

For this project the soil stability design limit would not be approached because of reclamation. Any steep slopes could have some erosion control problems, but the model assumes that no additional cost of erosion control blankets would be needed above erosion and sediment control structures.

Permitting and Environmental Cost.

Bonding. Under the Proposed Action bonding would be strengthened to include bonding of Notices at 100% of reclamation cost. Bonding would be used for reclaiming the site if the operation could not complete its reclamation obligations. This model assumes that the operator is purchasing an annuity bond from an agency. For the bond the operator would pay an insurance premium that would cost an estimated 2% per year of reclamation costs for 10 years through the operation and reclamation of the project. The bond amount is an estimated at $321,700.

Common Variety Determinations. Common variety determinations would be required for industrial mineral operations. The reclamation and strip mining models would be involved. This determination would verify that the mineral is locatable under the mining law or salable under the Mineral Materials Act of 1947.

Average cost = $30,000 per examination.

Unknown cost to industry if claim is in production and production is lost due to the claimant's assisting BLM in the exam. The model assumes that industry would carry the cost to get the project completed.

The cost to industry is assumed to be $30,000 for preparation work for BLM. It is assumed that only 10% of the exploration model and 50% for the strip mining model activities would require this additional cost.

Total Estimated Cost Changes. Estimated cost changes are summarized in Table E-16.

Table E-16. Alternative 3 – Change in Costs for a Strip Mine Project

Total Project Cost under Alternative 3	$2,846,700
Change in Costs due to Bonding Total Change in Costs	61,942 61,942
Total Project Costs	2,911,642
Percent Change in Costs from Alternative 1 to Alternative 3	+2%
Change in Costs Assuming Validity Exam Is Conducted	
Change in Costs under Alternative 3 due to Bonding Change in Costs under Alternative 3 due to Validity Exam	61,942 30,000
Total Project Costs	$2,941,642
Percent Change in Costs from Alternative 1 to Alternative 3	+3%

Alternative 4: Maximum Protection

Under Alternative 4, bonding, inspection and enforcement, soil stability, topsoil, and revegetation would directly affect strip mining.

The waste rock design and road designs would be incorporated into the mine design and would not usually involve major costs. This model assumes that Alternative 4 would incur no more costs for road and slope stability design standards.

The acid rock drainage testing would be completed during the environmental review. The model assumes that the kinetic test would be included in the review. No other tests would be run unless acid generation potential changes from the rock types tested.

Permitting and Environmental Cost.

Bonding. Bonding would not change from that outlined for the Proposed Action except that more money for major environmental events would be added. Other than for petroleum spills, strip mines would not need to address additional cost for major environmental problems. Any petroleum spill would require removing the contaminated soils and trucking them to an approved disposal site for treatment. No other chemicals are expected to be used onsite. This model assumes that the operator would build an oil treatment facility onsite and this site would handle all spills from the operation.

This model further assumes that the operator is purchasing from an agency an annuity bond, for which the operator would pay an insurance premium of 2% per year for 10 years through the operating and reclaiming of the project. The bond would amount to $321,700.

Inspections. Under Alternative 4 operators would be required to hire third-party contractors to monitor their operations. Required to monitor the operation quarterly, the contractor could complete the inspection and prepare the report in a 10-hour day. No environmental samples would be collected.

Common Variety Determinations. For industrial minerals common variety determination and validity exams would be required to determine if the mineral is locatable under the Mining Law or salable under the Mineral Materials Act of 1947. Common variety determinations would be required under the reclamation and strip mining models. The average cost per examination is $30,000. An operation would have an unknown cost if a claim is in production and production is lost due to the claimant's assisting BLM in the exam. This model assumes that industry would carry the cost to get the project completed.

Reclamation Cost.

Earth Work. Under Alternative 4 the topsoil would be removed by soil horizons. The operation would remove the topsoil just as under other alternatives, but increased travel times to stockpile locations would decrease the efficiency of the earth moving equipment by not allowing blades to cut as deeply as possible. But the increased travel times would not be so great as to double the time needed to remove the topsoil.

Under the other alternatives, earth moving equipment would move the soil and colluvium in one or two passes, mixing the material together. The material would be removed into different locations on either side of the road or drill pads. The travel distance would remain the same, but the efficiencies of the equipment would decrease. The efficiencies were estimated from the *Caterpillar Performance Handbook* (Caterpillar Inc. 1996) as 0.83. For Alternative 4 the efficiency would be estimated at 0.75. This time amounts to about 1 hour difference in the time needed to complete the dirt work.

Production rate
- Equipment = 615 Scraper
- Capacity = 16 yd^3
- Average haul distance = 1000 ft

Cycle time
- Cycles per hour = 13.33 cycles per minute

Correction factors
- Load factor = 0.9
- Job efficiency = 0.75
- Eff. Load capacity = 10.8 yd^3

Hourly production= 144 yd^3/hr

Cost Rates
- 615 scraper = $100/hr
- Operator = $ 40/hr

Using the above data, the following table estimates equipment and labor costs for regrading.

	Acres	Quantity	Hours	Equipment Cost	Labor Cost
Waste Rock	10	24,200	168	$16,800	$6,720
Roads	40	96,800	672	67,200	26,880
Ancillary Facilities	15	36,300	252	25,200	10,080
Cost of Applying Topsoil				109,200	43,680

Revegetation. Under Alternative 4 only native species could be used in revegetation. The open pit model outlines the seed mixture that would be used by this alternative. All other aspects of seeding the strip mine project would remain the same.

Using the above data, the following table estimates equipment and labor costs for revegetation.

	Acres	Time	Equipment Cost	Labor Cost
Waste Rock	10	10 hrs grader 3 hrs drill total	$800 150 950	$400 162
Roads	40	40 hrs 13 hrs total	3,200 650 3,800	1,600 202
Ancillary Facilities	15	15 hrs 5 hrs total	1,200 250 1,425	600 270
Cost of Revegetation			12,425	3,234

Soil Stability. To meet the stability standard for Alternative 4, more measures would need to be implemented. Any steep slopes could have some erosion control problems, but the added cost of erosion control blankets would be needed above standard erosion and sediment control structures. For analysis purposes the project would need erosion control blankets on the waste rock piles (20 acres) and the roads (20 acres) for a total of 40 acres. Erosion control blankets cost $0.45/yd^2, and the project will cost $87,120.

Wetlands. Alternative 4 requires that all wetlands be restored within 10 years after final closure and reclamation of the operation. If this restoration is not possible, then 1.5 times the amount disturbed or lost would need to be replaced. Reclamation is usually successful in restoring wetlands to proper functioning condition within 10 years. But open pit operations do remove wetlands in placing the pit and waste rock dumps. This model assumes that 10 acres of wetlands would be lost with the replacing of waste rock dumps.

Offsite mitigation is estimated to cost the same as stream restoration under Alternative 4 of the placer mining model. For alternative 4 the model assumes $2,500/acre (INTER-FLUVE, Inc. 1991), which is needed to meet the 10-year requirement for properly functioning condition for wetlands. A stream restoration cost of $2,500/acre was used for this alternative. The project would reclaim 15 acres at a cost of $37,500.

Total Estimated Cost Changes. If the exploration operation is not in an area withdrawn for minerals, the project would incur the costs shown in Table E-17.

Table E-17. Alternative 4 -- Change in Costs for a Strip Mine Project

Total Project Cost under Alternative 4:	$2,846,700
Change in Costs under Alternative 4 due to:	
Bond Cost	61,942
Third-Party Monitoring; 40 hrs at $50/hr/year for 10 years	20,000
Applying Top Soil	152,880
Revegetation Cost	2,516
Soil Stabilization	87,120
Validity Exam	30,000
Wetland Restoration	37,500
Total Change in Costs under Alternative 4:	391,958
Total Project Costs under Alternative 4:	$3,238,658
Percent Change in Costs from Alternative 1 to Alternative 4:	+ 12%

Open Pit Model

The open pit model is for a medium-sized gold mine of a larger mining company.

Resource size:	7,000,000 tons
Production rate:	4,000 tons per day
mine life:	6 years mining and 4 years reclamation
Average grade:	0.053 oz. per ton @ $300/oz. Strip ratio: 2:1
Pit dimensions:	1000 ft x 900 ft x 130 ft deep
Equipment used:	Rotary drill (GD-25C), hydraulic crawler drill (HDR12E), air compressor, 4 loaders (988-B), four 50-ton rear-dump trucks (733), dozer (D-8) dozer (TD-25), grader, 4,000 gal water truck , two maintenance trucks, and two pickups
Fuel:	10,000 gallon portable tank gasoline, 50,000 gallon portable tanks for diesel and propane
Processing:	The operation uses conventual heap leach technology. Chemicals used for this process are on the site. A construction material dump is onsite, and a bioremediation facility is onsite to process minor petroleum spills.

Crew:	60 workers
Housing:	Nearby towns
Permitting:	Environmental impact statement (EIS) completed in 18 months, high public interest, baseline studies required to complete EIS, extensive joint federal/state coordination, cultural field studies
Reclamation:	Post mining recontouring and revegetation, stream restoration, water stabilization and recharge, chemical stabilization, wildlife reclamation projects

Note: Waste rock dumps were built to the grade standards outlined for each alternative, i.e. Alternative 3 states a 2:1 slope or a stable system, whereas Alternative 4 states a 3:1 slope. Roads would be built to meet standards for the alternative. The pit would have a small pit lake. Ground water would flow into the pit lake and evaporate. The pit lake would not overflow seasonally. Material at the site has been tested and shows no acid generation potential. The waste rock would have a 30% swell factor.

The model was derived from *Mining Cost Services* (Western Mine Engineering, Inc. 1997b), CM Appendix D4. The difference between the cost index for the original model development and the cost index for this model development was slight. Therefore, adjustments would not need to be made.

Permitting and Environmental Cost

Plan of Operation Processing. Permitting and environmental costs are hard to determine in a generalized way. The costs of permit authorizations and environmental documentation highly vary with site-specific conditions. Depending on the ore body and its location and other local environmental conditions, the cost can cover a broad range. The operator would pay for the environmental impact statement, which would include hydrological and hydrogeology reports, acid rock drainage analysis, cultural surveys, soil and vegetation field surveys, fish and wildlife field surveys, Endangered Species Act Section 7 consultation, and pit water quality analysis. The costs developed for this model and alternatives were derived from several mining companies and consultant firms.

Bonding. The operation would require a Plan of Operations. The bond would be for 100% cost of the reclamation. Closing the heap leach pads and the rest of the mine would cost $2,000/acre. This model assumes that the operator is purchasing an annuity bond from an agency and would pay an insurance premium for the bond at an estimated 2% of the bond amount per year. The model further assumes that the operator has a good credit rating and has the assets to back the bond.

Reclamation Cost

Earthwork. The earthwork would consist of recontouring the waste rock dump, leach pads, roads, and ancillary facilities and covering all these features with topsoil. The dump had been built to easily conform to the slope requirement. The amount of material moved and the amount of time needed to move the material is estimated below for analysis purposes.

Regrading.

Production rate
Equipment = D9N and U Blade
Average Dozing distance = 300 ft
Final slope configurations =
2.5H:10V(40%)
Production = 500 yd^3/hr
Correction factors
Operator average = 0.75
Material - loose stockpile = 1.20
Type dozing - slot to side by side = 1.20
Job efficiency = 0.83
Weight correction = 0.83
Hourly Production rate = 372 cu. yd./hr
Cost Rates
Bulldozing (D9N) = $155/hr
Operator = $40/hr

Using the above data, the following table estimates equipment and labor costs for regrading.

	Acres	Quantity (yd^3)	Time (hours)	Equipment Cost	Labor Cost
Waste Rock	120	2,800,000	7,526	$1,166,530	$301,040
Roads*	200	250,000	672	104,160	26,880
Ancillary Facilities	150	150,000	403	62,465	16,120
Leach Pads	125	200,000	536	83,080	21,440
Total Cost for Regrading				$1,416,235	$365,480

*Assumption that ripping production is the same as blading work.

Applying Top Soil.

The growth medium would be applied to an average thickness of 6 inches, using a scraper.

Production rate
Equipment = 615 Scraper
Capacity = 16 yd^3
Average haul distance = 1000 ft
Cycle time
Cycles per hour = 13.33 cycles per minute
Correction factors
Load factor = 0.9
Job efficiency = 0.83
Eff. Load capacity = 14.4 yd^3

Hourly production= 159.4 yd
Cost Rates
  615 scraper = $100/hr
  Operator = $ 40/hr

Using the above data, the following table estimates equipment and labor costs for applying top soil.

	Acres	Quantity (yd³)	Hours	Equipment Cost	Labor Cost
Waste Rock	120	290,400	1,821	$182,100	$72,840
Roads	200	484,000	3,036	303,600	121,440
Ancillary Facilities	150	363,000	2,277	227,700	91,080
Leach Pads	125	302,500	1,897	189,700	75,880
Total Cost of Applying Top Soil				$903,100	$361,240

Revegetation. Revegetation would consist of scarifying and preparing the ground for seeding. Drill seeding would be applied. Aspects of wildlife enhancement and wetlands reclamation would be included in revegetation.

Production rates
  Equipment = 14-G Grader with scarifier
  Scarifying width = 10 feet
  Operating speed = 1.0 mph
  Production rate = 1.0 hr/ac
  Equipment = Small tractor and seed drill
  Seeding width = 10 feet
  Operating speed = 2.5 mph
  Production rate = 0.33hr/ac
  Travel length = 4356.0 ft/ac
Cost rates
  Tractor and seed drill = $50/hr
  14-G Grader = $80/hr
  Operator - grader = $40/hr
  Labor (2) = $27/ac

Seed Mixture

Species	$/lb (PLS)	Drilled rate	Price/ac
Slender Wheatgrass	$1.25/lb	3.0 lbs	$3.75/ac
Western Wheatgrass	$3.00/lb	2.0 lbs	$6.00/ac
Fourwing Saltbrush	$8.00/lb	1.0 lb	$8.00/ac
Yellow Sweetclover	$0.60/lb	0.5 lb	$0.30/ac
Basin Wildrye	$5.60/lb	1.0 lb	$5.60/ac

Shadscale	$6.50/lb	2.0 lbs	$13.00/ac
Small Burnett	$0.90/lb	2.0 lbs	$1.80/ac
Thickspike Wheatgrass	$8.25/lb	0.5 lb	$4.15/ac
Prostrate Kochia	$17.50/lb	0.25 lb	$4.40/ac
Sainfoin	$1.40/lb	2.0 lbs	$2.80/ac
Sandberg Bluegrass	$26.00/lb	0.25 lbs	$13.00/ac
			Total $56.30/ac

Using the above data, the following table estimates equipment and labor costs for reseeding.

	Acres	Hours	Equipment Cost ($)	Labor Cost ($)
Waste Rock	120	120 (grader) 39 (drill)	$9,600 1,950 6,756	$ 4,800 2,106
Roads	200	200 66	16,000 3,300 11,260	8,000 3,564
Ancillary Facilities	150	150 50	12,000 2,500 8,445	6,000 2,700
Leach pads	125	125 41	10,000 2,050 7,038	5,000 2,214
Cost of Reseeding			$90,899	$34,384

Chemical Stabilization. Chemical stabilization would involve neutralizing the cyanide content of the heap leach pads and processing facilities. Operating costs include any capital items such as pumps, piping, maintenance, and power. Costs for materials include the use of chemicals. The following figures were derived from submitted bond calculations and actual numbers from operations that have met closure. This reclamation involves heap flushing with water only. No other chemicals are added.

Removal of Structures. Structure removal would consist mainly of removing powerlines, process buildings, office trailers, maintenance shops, and high-density polyethylene pipelines used by the project. The model assumes that five workers would take 80 days to remove the facilities and bury the foundations.

Total Open Pit Costs.

Table E-18 lists total costs for the open pit mining model.

Table E-18. Open Pit Model Costs

Description of Activity	Cost Item	Unit Cost	Total Cost
Permitting	Environmental and Engineering Departments		
Plan Preparation	Several Weeks		$10,000
EIS preparation			600,000
	Includes: Wetlands Study	$5,000	
	Water-Related Reports	$200,000	
	Restoration and Reclamation	$5,000	
	Wildlife/Fisheries Studies	$10,000	
	Vegetation/soil Report	$5,000	
	Cultural Survey	$20,000	
Bond Cost	Estimated Bond $2,891,842	2% for 10yrs	578,363
Permitting Total			**1,188,368**
Reclamation			
Capital Cost			14,000,000
Operating Cost - Labor			10,368,000
Operating Cost - Equipment			1,382,400
Exploration Activity Total			**$25,750,400**
Reclamation:			
Earth Work			
Regrading			
Equipment*:	D9N Dozer	155/hr	1,416,235
Labor*:	operator	40/hr	365,480
Applying top soil			
Equipment*:	615 Scraper	100/hr	903,100
Labor*:	operator	40/hr	361,240
Revegetation			
Equipment*	: 14-G Grader	80/hr	
	Small Tractor and seed drill	50/hr	90,899
	Seed mixture	56.30/ac	
Labor*:	Grader operator	40/hr	34,384
Total earth work and revegetation	2 laborers	27/hr	
			3,171,338
Chemical Stabilization			
Estimated 7,000,000 tons, rinsing time 3 years	Operating Cost	0.07/ton	490,000
	Materials Cost	0.05/ton	350,000
Total Chem. Stabilization	Labor: 2 people, 12 hours/day, 5 days/wks	27/hr	505,440
			1,345,440
Structural removal			
Equipment			
	2.5 ton truck for 80 days	60/day	
	Ho-lift equipment, 24ft boom-7.7mt lift	165/day	
	D9N Dozer for 2 days	155/hr	20,480
Labor			
Total Structural removal	5 person crew for 80 days at 8 hours/day	27/hr	8,100
Reclamation Total			*106,880*
			4,623,558
Total Cost of Open Pit Project			**$31,562,426**

*See estimated time to complete task in information above.

Alternative 1: No Action

Costs would not change under Alternative 1 because the regulations would not change.

Alternative 2: State Management

Determining costs for Alternative 2 for all of the states in the EIS study area would not be practical for this exercise. Therefore, the following cost calculations assume that the state programs are based on current BLM regulations. A review of state programs reveals that they are similar in requirements for posting reclamation bonds, for surface and ground water, and for reclamation.

This analysis assumes that the state would require a submission of a Plan of Operations. The state would still require reclamation, the posting of bond, and monitoring for compliance, but not environmental review for such values as cultural, cave, and wildlife resources.

Permitting and Environmental Costs.

Plan of Operations Processing. The operator would have to submit a Plan of Operations to the state but not to BLM. The project would not undergo environmental review, and the operator would not pay for an environmental impact statement.

Reclamation Cost.

This analysis assumes that the state requires reclamation and that the company would have to reclaim any disturbance resulting from its operation. Reflecting general state programs, the purpose of reclamation would be only to stabilize soil and slopes. Therefore, this analysis assumes that the state would require only grasses for soil stability and that reclamation would not require restoring wildlife and fisheries habitat.

Seed Mixture

Species	$/lb (PLS)	Drilled rate	Price/ac
Slender Wheatgrass	$1.25/lb	3 lbs	$3.75/ac
Western Wheatgrass	$3.00/lb	2 lbs	$6.00/ac
Basin Wildrye	$5.60/lb	1 lb	$5.60/ac
Thickspike Wheatgrass	$8.25/lb	0.5 lb	$4.15/ac
Sandberg Bluegrass	$26.00/lb	0.25	$13.00/ac
			Total $32.50/ac

The following cost calculations show the cost for the seed mixture under Alternative 2.

Waste Rock	120 acres	$3,900.00
Roads	200 acres	$6,500.00
Ancillary Facilities	150 acres	$4,875.00
Leach pads	125 acres	$4,062.50
	Total	$19,337.50

Total Estimated Cost Changes. Total cost savings for this open pit project under Alternative 2 are summarized in Table E-19.

Table E-19. Alternative 2 -- Changes in Costs for a Open Pit Project

Total Project Cost under Alternative 1 (Existing Regulations)	$31,562,462
Change in Costs under Alternative 2 due to	
Elimination of Environmental Review	(600,000)
Change in Seed cost	(14,161)
Total Change in Costs under Alternative 2	(614,161)
Total Project Cost under Alternative 2 (State Management)	30,948,300
Percent Change in Costs from Alternative 1 to Alternative 2	- 2 %

Alternative 3: Proposed Action

Impacts to the industry under the Proposed Action would be slight because BLM and industry are generally following these procedures in authorizing operations and accepting final closure and reclamation.

Under the Proposed Action any operation within a mineral withdrawal area would have the additional cost in time and money of completing a validity exam of the claims. The additional cost to industry would involve bond cost, stabilizing the soil, and backfilling. Land use plans are assumed to conform to mineral activity.

Reclamation would not approach the soil stability design limit. Any steep slopes could have some erosion problems, but this model assumes that no additional cost of erosion control blankets would be incurred above erosion and sediment control structures.

The operation would have a small pit lake. This model assumes that ground water flows into the pit and that for environmental and economic reasons 25% of the pit would be backfilled and the pit lake would be covered. To offset the loss of habitat from the open pit, a 200-acre vegetation conversion would be completed with water developments.

Permitting and Environmental Costs.

Bonding. The Proposed Action would strengthen bonding to include bonding of Notice-level operations at 100% of reclamation costs. Bonding would be used for reclaiming sites if operators could not meet their reclamation obligations.

This model assumes that the operator is purchasing an annuity bond and paying an insurance premium that would cost 2% of the bond amount, estimated at $4,623,558. The bond would be assessed on the estimated reclamation cost and for 10 years through mining and reclamation.

Validity Exams. This provision requires that a validity exam be conducted before BLM approves a Plan of Operations within an area withdrawn from the mining laws. These costs would remain the same as outlined for exploration under Alternative 3.

Reclamation Costs.

Backfilling. In placer and strip mines after processing, materials mined are normally placed in the mine opening at only minimal cost. Well-blasted rock, however, swells about 50% in volume, and not all material would be returned to the pit. The rest of the materials would have to be reshaped in place and reclaimed. For this operation the model assumes that only 25% of the material would need to be replaced into the pit. The pit would be only partially filled for economic or environmental reasons.

A study by BLM's Nevada State Office (BLM 1998d) on the economics of pit backfilling found that the cost of returning material to a pit ranged from $0.68 to $1/ton. This model uses the average of the figures as $0.75/ton.

The model assumes 7 millions tons of reserves and 14 million tons of overburden. Of this overburden only 25% or 3.5 million tons would be returned to the pit. The remaining waste rock would be placed in a waste rock dump built to conform to the 3:1 slope standard. The amount of material to be moved to complete the final contours would be 25% less than that moved under Alternative 1. Therefore, 10.5 million tons of material would be placed in waste rock dumps. The current model shows that 2.8 million tons of material would have to be recontoured. With 25% of this material removed and placed in the pit, only 2.1 million tons of material would need to be moved to recontour the waste rock dumps. The hourly production rate is 372 yd^3/hr.

Cost Rates
Bulldozing (D9N) = $155/hr
Operator = $40/hr

Using the above data, the following table estimates equipment and labor costs for recontouring.

	Acres	Quantity (yd³)	Time (hours)	Equipment Cost	Labor Cost
Waste Rock	120	2,100,000	5645	$874,975	$225,800
Roads*	200	250,000	672	104,160	26,880
Ancillary Facilities	150	150,000	403	62,465	16,120
Leach Pads	125	200,000	536	83,080	21,440
Total for Recontouring				$1,124,700	$290,200

*Assumption that ripping production is the same as blading work.

Total cost of recontouring work for Alternative 3 = $1,414,920

The cost under Alternative 1 would amount to $1,781,715, and the cost under Alternative 3 would be $1,414,920. Alternative 3 would thus save $366,795 over Alternative 1 by recontouring less material and returning more to the pit.

$2,625,000 for backfilling minus the cost saving of recontouring—$366,795

For a total cost of backfilling operation at 25% = **$2,258,205.**

Total Estimated Cost Changes. Estimated cost changes for an open pit mine are summarized in Table E-20.

Table E-20. Alternative 3 -- Change in Costs for an Open Pit Project	
Total Project Cost under Alternative 3	$31,562,426
Change in Costs under Alternative 3 due to Bonding Reclamation Total Change in Costs under Alternative 3	 364,700 2,258,200
Total Project Costs under Alternative 3	34,185,326
Percent Change in Costs from Alternative 1 to Alternative 3	8%
Change in Costs Assuming Validity Exam is Conducted	
Change in Costs under Alternative 3 due to Bonding Reclamation Validity Exam	 364,700 2,258,200 10,000
Total Project Costs under Alternative 3	34,195,326
Percent Change in Costs from Alternative 1 to Alternative 3	8%

Alternative 4: Maximum Protection

Alternative 4 would directly affect open pit mining through requirements for bonding, inspection and enforcement, backfilling, stabilizing soil, handling topsoil, and revegetation. The need for validity exams, bonding criteria, and fish and wildlife habitat and wetland protection could also affect open pit operations. Waste rock and road designs would be incorporated into the mine design and would not normally have a major economic cost. This model assumes no additional cost for road and slope stability design standards under Alternative 4.

The acid rock drainage testing would be completed during the environmental review. This model assumes that a kinetic test would be included in the review. No other tests would be run unless the potential for acid generation changes from the rock types tested.

For ease of analysis, water from the mine is assumed not to require long-term treatment. The cost of the different types of water treatment vary greatly. If water is treated, it would be difficult to determine if the treatment would stop in 20 years.

Permitting and Environmental Costs.

Bonding. Bonding under Alternative 4 would be as outlined for Alternative 3 but would include more money to cover potential unplanned environmental events, which could involve both processing chemicals and chemicals used in labs and for equipment maintenance (fuels and lubricants).

For open pit mines most spills that would involve more costs for major environmental problems would be petroleum spills. For this model any petroleum spill would be removed with the contaminated soils and trucked to an approved disposal site for treatment. This model assumes that the operator would build an oil treatment facility onsite to handle all spills from this operation. Because estimating the cost of each type of spill scenario would be difficult, this analysis assumes that $250,000 more would be assigned to the bond, placing the current estimated bond at $4,983,658.

The analysis again assumes that the operator is purchasing an annuity bond from an agency and would pay an insurance premium for the bond. This insurance would cost the operator 2% of the bond amount for 10 years through project operation and reclamation.

Inspections. Under Alternative 4 operators would have to hire third-party contractors to monitor their operations. Contractors would have to monitor operations quarterly and could complete inspections and prepare reports in a 10-hour day. Environmental samples would be taken during operations. These samples would be used for acid/base accounting to monitor the acid rock drainage potential and for the 31-element analysis of water quality areas throughout the mine. This model assumes costs from the Nevada Division of Environmental Protection's Profile II analysis. These samples would be collected only to verify operator results.

Labor			
	40 hrs @ $50/hr/year for 10 years (Davis and Bacon)		$20,000
Lab work			
	Acid/Base accounting	$33.08/sample @ 40 samples	$1,323
	Profile II	$354.24/sample @ 40 samples	$14,170
		Total cost	**$35,493**

Validity Exams. Under Alternative 4 validity exams would need to be conducted before BLM approves Plans of Operations. These costs would remain the same as outlined for exploration under Alternative 3.

Reclamation Costs.

Backfilling. In placer and strip mines, materials mined are normally placed in the mine opening after processing, and only minimal cost is involved. Well-blasted rock would swell about 50% in volume. The material would not go back completely into the pit. The rest must be reshaped in place and reclaimed.

A BLM Nevada State Office (BLM 1998d) study on the economics of pit backfilling found that the cost of returning material to a pit ranged from $0.68 to $1/ton. This model uses the average of the figures as $0.75/ton. The model assumes 7 millions tons of reserves and 14 million tons of overburden and that 75% of the material would be required to fill up the pit and 25% of the material would be placed in a waste rock dump. A total of 10.5 million tons of material would be placed in the pit and would cost $7,875,000.

The remaining waste rock would be placed in a waste rock dump. The dump would be built to conform to the 3:1 slope standard. The amount of material to be moved to complete the final contours—175,000 tons—would be 25% less than what would be moved under the Alternative 1 scenario. This analysis assumes that only 50 acres are now covered in waste rock dumps.

Hourly Production rate = 372 yd^3/hr

Cost Rates

Bulldozing (D9N) = $155/hr

Operator = $40/hr

Using the above data, the following table estimates equipment and labor costs for backfilling.

	Acres	Quantity (yd³)	Hours	Equipment Cost	Labor Cost
Waste Rock	50	175,000	470	$72,850	$18,800
Roads*	200	250,000	672	104,160	26,880
Ancillary Facilities	150	150,000	403	62,465	16,120
Leach Pads	125	200,000	536	83,080	21,440
Total Cost To Recontour				$322,600	$83,200

*Assumption that ripping production is the same as blading work.

The cost of recontouring under Alternative 1 would amount to $1,781,715, and the cost of recontouring under Alternative 4 would amount to $405,800. Alternative 4 would save $1,375,920 in recontouring costs because less material would be recontoured and more would be returned to the pit.

$7,875,000 for backfilling minus the cost saving of recontouring—$1,375,920

For a total cost of backfilling operation at 25% = **$6,499,080.**

Topsoil. Under Alternative 4 the topsoil would be removed by soil horizons. Operations would remove the topsoil as under other alternatives, but increased travel time to stockpile sites would decrease the efficiency of the earth moving equipment by not allowing the blade to take as deep a cut as possible. But the increased travel times would not be so great as to double the time needed to remove topsoil.

Under the other alternatives earth moving equipment would mix the soil and colluvium together as it moves them in one or two passes. Under Alternative 4 the material would be removed to different locations on either side of the road or drill pads. The travel distance would remain the same, but the efficiencies of the equipment would decrease. Efficiencies were estimated from the *Caterpillar Performance Handbook* (Caterpillar Inc. 1996) as 0.83. For Alternative 4 the efficiency would be estimated at 0.75, about 1 hour more needed to complete the dirt work under the other alternatives.

Production rate
    Equipment = 615 Scraper
    Capacity = 16 yd^3
    Average haul distance = 1000 ft
Cycle time
    Cycles per hour = 13.33 cycles per minute

Correction factors	
Load factor =	0.9
Job efficiency =	0.75
Eff. Load capacity =	10.8 yd^3
Hourly production=	144 yd^3/hr
Cost Rates	
615 scraper =	$100/hr
Operator =	$ 40/hr

Using the above data, the following table estimates equipment and labor costs of earthwork.

	Acres	Quantity (yd^3)	Hours	Equipment Cost	Labor Cost
Waste Rock	50	90,750	630	$63,000	$25,200
Roads	200	484,000	3,361	336,100	134,440
Ancillary Facilities	150	363,000	2,520	252,000	100,800
Leach Pads	125	302,500	2,100	210,000	84,000
Total Cost for Earthwork				$861,100	$344,500

Revegetation. Under Alternative 4 only native species would be used in revegetation. The open pit model outlines the seed mixture that would be used. All other aspects of seeding the exploration project would remain the same as under Alternative 1.

Seed Mixture (Mining Cost Service)

Species	**Amount**
Sanberg Bluegrass	20%
Indian Rice Grass	20%
Blue Grama	20%
Thickspike Wheatgrass	10%
Sand Dropseed	10%
Blue Flax	10%
Purple Coneflower	5%
Prairie Coneflower	5%
Scarlet Globemallow	5%
Utah Sweet Vetch	5%
Total $9.50/lb @ 10lbs/ac	$95/ac

4/40

Using the above data, the following table estimates equipment and labor costs of revegetation.

	Acres	Hours	Equipment Cost	Labor Cost
Waste Rock	50	50 grader 25 drill	$4,000 1,250 4,750	$2,000 1,350
Roads	200	200 66	16,000 3,300 19,000	8,000 3,564
Ancillary Facilities	150	150 50	12,000 2,500 14,250	6,000 2,700
Leach pads	125	125 41	10,000 2,050 11,875	5,000 2,214
Total Revegetation Cost			$100,975	$30,828

Soil Stability. To meet the stability standard for Alternative 4 other measures would need to be implemented. Any steep slopes could have some erosion control problems, but the added cost of erosion control blankets would be needed above standard erosion and sediment control structures. For analysis purposes the following acreage would need erosion control blankets: waste rock 20 acres, roads 20 acres, leach pads 20 acres, for a total of 80 acres. Erosion control blankets cost $0.45/yd^2. For 80 acres @ 4840 yd^2/acre, for a total of 287,200 yd^2 to be covered, the total cost would amount to $174,240.

Fish and Wildlife. Under Alternative 4 within 10 years some areas of the mine might not return to the fish and wildlife habitat of premining status. Some offsite mitigation would be required to offset this loss. The common type of mitigation is vegetation manipulation. These types of actions take marginal habitat and change the vegetation to a more suitable habitat. Conversations with BLM biologists reveal that the average cost of such manipulation amounts to $1,000/acre. This analysis assumes that the pit and some of the haul roads would not be reclaimed within the 10 years and that 100 acres of vegetation would be manipulated at a cost of $100,000.

Wetlands. Alternative 4 would require that any wetlands would have to be restored within 10 years after a mine closes and is reclaimed. If this goal cannot be reached, then 1.5 times the amount of disturbed or lost land would need to be replaced. Reclamation is usually successful in restoring wetlands to proper functioning condition within 10 years. But open pit mines do remove wetlands in placing the pit or the waste rock dumps. This model assumes that 10 acres of wetlands would be lost to waste rock dumps.

The cost of offsite mitigation is estimated at the same cost as stream restoration under Alternative 4 of the placer mining model. For Alternative 4 the model assumes $2,500/acre (INTER-FLUVE, Inc. 1991), which is needed to meet the 10-year requirement for wetlands in properly functioning conditions. This analysis assumes stream restoration cost to be $2,500/acre for 15 acres for a total cost of $37,500.

Total Estimated Cost Changes. If the exploration operation is not within an area withdrawn for minerals, the project would incur the costs shown in Table E-21.

Table E-21. Alternative 4 -- Change in Costs for an Open Pit Project	
Total Project Cost under Alternative 4:	$31,562,426
Change in Costs under Alternative 4 Due To:	
Bond Cost	418,400
Third Party Monitoring	35,500
Backfill Cost Minus Earthwork Cost	6,499,080
Applying Top Soil	(58,740)
Revegetation Cost	6,520
Soil Stabilization	174,240
Habitat Restoration	100,000
Validity Exam	10,000
Wetland Restoration	37,500
Total Change in Costs under Alternative 4:	7,215,980
Total Project Costs under Alternative 4:	38,778,400
Percent Change in Costs from Alternative 1 to Alternative 4:	+ 19%

Table E-22 outlines the change in cost and the percentage of change in cost between Alternative 1 and the others alternatives analyzed in this EIS.

Table E-22. Total Cost of Mine Models

	Alternative 1	Alternative 2	% Change	Alternative 3	% Change	Alternative 4	% Change
Exploration	$207,370	$206,200	-1	$207,500 300,000	0 +31	$319,300	+35
Placer	1,124,400	1,028,500	0	1,171,300 1,174,100	+4 +5	1,275,300	+13
Strip Mining	2,846,700	2,765,200	-3	2,911,600 2,941,600	+2 +3	3,238,700	+12
Open Pit	$31,562,462	$30,948,300	-2	34,185,300 $34,195,300	+8 +8	$38,778,400	+19

APPENDIX F
PLANT AND ANIMAL LISTS

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Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

Alaska

E--Aleutian shield-fern (=Aleutian holly-fern) (*Polystichum aleuticum*)

Arizona

E -- Arizona agave (*Agave arizonica*)
E -- Kearney's blue-star (*Amsonia kearneyana*)
T -- Welsh's milkweed (*Asclepias welshii*)
E -- Sentry milk-vetch (*Astragalus cremnophylax* var. *cremnophylax*)
T -- Navajo sedge (*Carex specuicola*)
T -- Cochise pincushion cactus (*Coryphantha* (=Escobaria) *robbinsorum*)
E -- Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*)
T -- Jones cycladenia (*Cycladenia humilis* var. *jonesii*)
E -- Nichol's Turk's head cactus (Echinocactus *horizonthalonius* var. *nicholii*)
E -- Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*)
E -- Huachuca water-umbel (*Lilaeopsis schaffneriana* ssp. *recurva*)
E -- Brady pincushion cactus (*Pediocactus bradyi*)
E -- Peebles Navajo cactus (*Pediocactus peeblesianus* var. *peeblesianus*)
T -- Siler pincushion cactus (*Pediocactus sileri*)
E -- Arizona cliffrose (*Purshia subintegra*)
T -- San Francisco Peaks groundsel (*Senecio franciscanus*)
E -- Canelo Hills ladies'-tresses (*Spiranthes delitescens*)
C -- Goodding's onion (*Allium gooddingii*)
C -- Holmgren milk-vetch (*Astragalus holmgreniorum*)
C -- Arizona bugbane (*Cimicifuga arizonica*)
C -- Arizona leatherflower (*Clematis hirsutissima* var. *arizonica*)
C -- Gentry's indigobush (*Dalea tentaculoides*)
C -- Acuna cactus (*Echinomastus erectocentrus* var. *acunensis*)
C -- Lemmon fleabane (*Erigeron lemmonii*)
C -- Kaibab plains cactus (Pediocactus paradinei)
C -- Fickeisen plains cactus (*Pediocactus peeblesianus* var. *fickeiseniae*)
PE -- Parish's alkali grass (*Puccinella parishii*)
C -- Blumer's dock (*Rumex orthoneurus*)

California

E -- San Mateo thornmint (*Acanthomintha obovata* ssp. *duttonii*)
T -- San Diego thornmint (*Acanthomintha ilicifolia*)
E -- Mun's onion (*Allium munzii*)
E -- Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)
E -- Large-flowered fiddleneck (*Amsinckia grandiflora*)
E -- Hoffmann's rock-cress (*Arabis hoffmannii*)
E -- McDonald's rock-cress (*Arabis mcdonaldiana*)
T -- Morro manzanita (*Arctostaphylos morroensis)*
E -- Presidio (=Raven's) manzanita (Arctostaphylos hookeri var. ravenii)
E -- Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*)
E -- Santa Rosa Island manzanita (*Arctostaphylos confertiflora*)
T -- Pallid manzanita (*Arctostaphylos pallida*)
E -- Marsh sandwort (*Arenaria paludicola*)
T -- Bear Valley sandwort (*Arenaria ursina*)
E -- Cushenbury milk-vetch (*Astragalus albens*)
E -- Braunton's milk-vetch (*Astragalus brauntonii*)

Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

E -- Clara Hunt's milk-vetch (*Astragalus clarianus*)
E -- Lane Mountain (=Coolgardie) milk-vetch (*Astragalus jaegerianus*)
E -- Coachella Valley milk-vetch (*Astragalus lentiginosus* var. *coachellae*)
T -- Fish Slough milk-vetch (*Astragalus lentiginosus* var. *piscinensis*)
T -- Peirson's milk-vetch (*Astragalus magdalenae* var. *peirsonii*)
E -- Coastal dunes milk-vetch (*Astragalus* tener var. *titi*)
E -- Triple-ribbed milk-vetch (*Astragalus tricarinatus*)
E -- San Jacinto Valley crownscale (=saltbush) (*Atriplex coronata* var. *notatior*)
T -- Encinitis baccharis (=Coyote bush) (*Baccharis vanessae*)
E -- Nevin's barberry (*Berberis nevinii*)
E -- Island barberry (*Berberis pinnata* ssp. *insularis*)
E -- Truckee barberry (*Berberis sonnei*)
E -- Sonoma sunshine (=Baker's stickyseed) (*Blennosperma bakeri*)
T -- Thread-leaved brodiaea (*Brodiaea filifolia*)
T -- Chinese Camp brodiaea (*Brodiaea pallida*)
T -- Tiburon mariposa lily (*Calochortus tiburonensis*)
T -- Mariposa pussypaws (*Calyptridium pulchellum*)
E -- Stebbins' morning-glory (*Calystegia stebbinsii*)
T -- San Benito evening-primrose (*Camissonia benitensis*)
E -- White sedge (*Carex albida*)
E -- Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*)
T -- Fleshy owl's-clover (*Castilleja campestris* ssp. *succulenta*)
T -- Ash-gray paintbrush (*Castilleja cinerea*)
E -- San Clemente Island Indian paintbrush (*Castilleja grisea*)
E -- Soft-leaved paintbrush (*Castilleja mollis*)
E -- California jewelflower (*Caulanthus californicus*)
E -- Coyote ceanothus (=Coyote Valley California-lilac) (*Ceanothus ferrisae*)
T -- Vail Lake ceanothus (*Ceanothus ophiochilus*)
E -- Pine Hill ceanothus (*Ceanothus roderickii*)
T -- Spring-loving centaury (*Centaurium namophilum*)
E -- Catalina Island mountain-mahogany (*Cercocarpus traskiae*)
T -- Hoover's spurge (*Chamaesyce hooveri*)
E -- Howell's spineflower (*Chorizanthe howellii*)
E -- Orcutt's spineflower (*Chorizanthe orcuttiana*)
E -- Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*)
T -- Monterey spineflower (*Chorizanthe pungens* var. *pungens*)
E -- Robust spineflower (includes Scotts Valley spineflower) (*Chorizanthe robusta*)
E -- Sonoma spineflower (*Chorizanthe valida*)
E -- Chorro Creek bog thistle (*Cirsium fontinale obispoense*)
E -- Fountain thistle (*Cirsium fontinale* var. *fontinale*)
E -- Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*)
E -- Presidio clarkia (*Clarkia franciscana*)
E -- Vine Hill clarkia (*Clarkia imbricata*)
E -- Pismo clarkia (*Clarkia speciosa* ssp. *immaculata*)
T -- Springville clarkia (*Clarkia springvillensis*)
E -- Salt marsh bird's-beak (*Cordylanthus maritimus* ssp. *maritimus*)
E -- Palmate-bracted bird's-beak (*Cordylanthus palmatus*)
E -- Pennell's bird's-beak (*Cordylanthus tenuis* ssp. capillaris)
E -- Soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*)
E -- Santa Cruz cypress (*Cupressus abramsiana*)

Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

T -- Gowen cypress (*Cupressus goveniana* ssp. *goveniana*)
E -- San Clemente Island larkspur (*Delphinium variegatum* ssp. *kinkiense*)
E -- Slender-horned spineflower (*Dodecahema leptoceras*)
T -- Conejo dudleya (*Dudleya abramsii* ssp. *parva*)
T -- Marcescent dudleya (*Dudleya cymosa* ssp. *marcescens*)
T -- Santa Monica Mountains dudleya (*Dudleya cymosa* ssp. *ovatifolia*)
T -- Santa Cruz Island dudleya (*Dudleya nesiotica*)
E -- Santa Clara Valley dudleya (*Dudleya setchellii*)
T -- Laguna Beach liveforever (*Dudleya stolonifera*)
E -- Santa Barbara Island liveforever (*Dudleya traskiae*)
T -- Verity's dudleya (*Dudleya verityi*)
E -- Kern mallow (*Eremalche kernensis*)
E -- Santa Ana River woolly-star (*Eriastrum densifolium* ssp. sanctorum)
T -- Hoover's woolly-star (*Eriastrum hooveri*)
T -- Parish's daisy (*Erigeron parishii*)
E -- Indian Knob mountain balm (*Eriodictyon altissimum*)
T -- Southern mountain wild-buckwheat (*Eriogonum kennedyi* var. *austromontanum*)
E -- Cushenbury buckwheat (*Eriogonum ovalifolium* var. *vineum*)
E -- San Mateo woolly sunflower (*Eriophyllum latilobum*)
E -- San Diego button-celery (*Eryngium aristulatum* var. *parishii*)
E -- Loch Lomond coyote-thistle (*Eryngium constancei*)
E -- Contra Costa wallflower (*Erysimum capitatum* var. *angustatum*)
E -- Menzies' wallflower (*Erysimum menziesii*)
E -- Ben Lomond wallflower (*Erysimum teretifolium*)
E -- Pine Hill flannelbush (*Fremontodendron californicum* ssp. *decumbens*)
E -- Mexican flannelbush (*Fremontodendron mexicanum*)
E -- Island bedstraw (*Galium buxifolium*)
E -- El Dorado bedstraw (*Galium californicum* ssp. *sierrae*)
E -- Monterey gilia (Gilia tenuiflora ssp. arenaria)
E -- Hoffmann's slender-flowered gilia (*Gilia tenuiflora* ssp. *hoffmannii*)
T -- Ash Meadows gumplant (*Grindelia fraxino-pratensis*)
T -- Island rush-rose (*Helianthemum greenei*)
T -- Otay tarplant (*Hemizonia conjugens*)
T -- Marin dwarf-flax (*Hesperolinon congestum*)
T -- Water howellia (*Howellia aquatilis*)
E -- Burke's goldfields (*Lasthenia burkei*)
E -- Contra Costa goldfields (*Lasthenia conjugens*)
E -- Beach layia (Layia carnosa)
E -- San Joaquin wooly-threads (*Lembertia congdonii*)
E -- San Bernardino Mountains bladderpod (*Lesquerella kingii* ssp. *bernardina*)
E -- San Francisco lessingia (*Lessingia germanorum* (=L. g. var. *germanorum*)
E -- Western lily (*Lilium occidental*)
E -- Pitkin Marsh lily (*Lilium pardalinum* ssp. *pitkinense*)
E -- Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*)
E -- Sebastopol meadowfoam (*Limnanthes vinculans*)
E -- San Clemente Island woodland-star (*Lithophragma maximum*)
E -- San Clemente Island broom (*Lotus dendroideus* ssp. *traskiae*)
E -- Clover lupine (*Lupinus tidestromii*)
E -- San Clemente Island bush-mallow (*Malacothamnus clementinus*)
E -- Santa Cruz Island bush-mallow (*Malacothamnus fasciculatus* var. *nesioticus*)

Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

E -- Santa Cruz Island malocothrix (*Malacothrix indecora*)
E -- Island malacothrix (*Malacothrix squalida*)
E -- Willowy monardella (*Monardella linoides* ssp. *viminea*)
T -- Navarretia, spreading (=prostrate, =no-named) (*Navarretia fossalis*)
E -- Navarretia, few-flowered (*Navarretia leucocephala* ssp. *pauciflora* (=N. *pauciflora*))
E -- Navarretia, many-flowered (*Navarretia leucocephala* ssp. *plieantha*)
T -- Colusa grass (*Neostapfia colusana*)
E -- Amargosa niterwort (Nitrophila mohavensis)
E -- Eureka Valley evening-primrose (*Oenothera avita* ssp. eurekensis)
E -- Antioch Dunes evening-primrose (*Oenothera deltoides* ssp. *howellii*)
E -- Bakersfield cactus (*Opuntia treleasei*)
E -- California Orcutt grass (*Orcuttia californica*)
T -- San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*)
E -- Hairy (=pilose) Orcutt grass (*Orcuttia pilosa*)
T -- Slender Orcutt grass (*Orcuttia tenuis*)
E -- Sacramento Orcutt grass (*Orcuttia viscida*)
E -- Cushenbury oxytheca (*Oxytheca parishii* var. *goodmaniana*)
E -- Lake County stonecrop (*Parvisedum leiocarpum*)
E -- White-rayed pentachaeta (*Pentachaeta bellidiflora*)
E -- Lyon's pentachaeta (*Pentachaeta lyonii*)
E -- Island phacelia (*Phacelia insularis* ssp. *insularis*)
E -- Yadon's piperia (*Piperia yadonii*)
E -- Calistoga allocarya (Plagiobothrys strictus)
E -- San Bernardino bluegrass (*Poa atropurpurea*)
E -- Napa bluegrass (*Poa napensis*)
E -- San Diego mesa mint (*Pogogyne abramsii*)
E -- Otay mesa mint (*Pogogyne nudiuscula*)
E -- Hickman's potentilla (*Potentilla hickmanii*)
E -- Hartweg's golden sunburst (*Pseudobahia bahiifolia*)
T -- San Joaquin adobe sunburst (*Pseudobahia peirsonii*)
E -- Gambel's watercress (*Rorippa gambellii*)
T -- Layn's butterweed (*Senecio layneae*)
E -- Santa Cruz Island rockcress (*Sibara filifolia*)
E -- Kenwood Marsh checker-mallow (*Sidalcea oregana* ssp. *valida*)
E -- Pedate checker-mallow (Sidalcea pedata)
E -- Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*)
E -- Tiburon jewelflower (*Streptanthus niger*)
E -- California seablite (*Suaeda californica*)
E -- Eureka Dune grass (*Swallenia alexandrae*)
E -- California taraxacum (*Taraxacum californicum*)
E -- Slender-petaled mustard (*Thelypodium stenopetalum*)
T -- Hidden Lake bluecurls (*Trichostema austromontanum* ssp. *compactum*)
E -- Showy Indian clover (*Trifolium amoenum*)
E -- Monterey (=Del Monte) clover (*Trifolium trichocalyx*)
E -- Greene's orcutt grass (*Tuctoria greenei*)
E -- Solano grass (*Tuctoria mucronata*)
T -- Red Hills vervain (*Verbena californica*)
T -- Big-leaved crownbeard (*Verbesina dissita*)
C -- Ramshaw Meadows sand-verbena (*Abronia alpina*)
PE -- San Diego thornmint (*Acanthomintha ilicifolia*)

Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

PE -- Munz's onion (*Allium munzii*)
PT -- Rawhide Hill onion (*Allium tuolumnense*)
PE -- Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)
PT -- Johnston's rock-cress (*Arabis johnstonii*)
PT -- Ione manzanita (*Arctostaphylos myrtifolia*)
PT -- Pallid manzanita (*Arctostaphylos pallida*)
PT - Bear Valley sandwort (*Arenaria ursina*)
PE - Clara Hunt's milk-vetch (*Astragalus clarianus*)
PE - Lane Mountain milk-vetch (*Astragalus jaegerianus*)
PE - Coachella Valley milk-vetch (*Astragalus lentiginosus* var. *coachellae*)
PT - Shining milk-vetch (*Astragalus lentiginosus* var. *micans*)
PE - Fish Slough milk-vetch (*Astragalus lentiginosus* var. *piscinensis*)
PT - Sodaville milk-vetch (*Astragalus lentiginosus* var. *sesquimetralis*)
PE - Peirson's milk-vetch (*Astragalus magdalenae* var. *peirsonii*)
PE - Coastal dunes milk-vetch (*Astragalus tener* var. *titi*)
PE - Triple-ribbed milk-vetch (*Astragalus tricarinatus*)
PE - San Jacinto Valley crownscale (*Atriplex coronata* var. *notatior*)
PE - Nevin's barberry (*Berberis nevinii*)
PT - Thread-leaf brodiaea (*Brodiaea filifolia*)
PE - Chinese Camp brodiaea (*Brodiaea pallida*)
PE -- Mariposa pussy-paws (*Calyptridium pulchellum*)
PE -- White sedge (*Carex albida*)
PT -- Carpenteria (*Carpenteria californica*)
PT -- Ash-gray paintbrush (*Castilleja cinerea*)
PT -- Vail Lake ceanothus (*Ceanothus ophiochilus*)
C -- Purple amole (*Chlorogalum purpureum* var. *purpureum*)
C -- Camatta Canyon amole (*Chlorogalum purpureum* var. *reductum*)
PE -- Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*)
C -- La Graciosa thistle (*Cirsium loncholepis*)
PE -- Vine Hill clarkia (*Clarkia imbricata*)
PT -- Springville clarkia (*Clarkia springvillensis*)
PE -- Soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*)
PE -- Baker's larkspur (*Delphinium bakeri*)
PE -- Yellow larkspur (*Delphinium luteum*)
PE -- Laguna Beach liveforever (*Dudleya stolonifera*)
C -- Lompoc yerba santa (*Eriodictyon capitatum*)
PE -- Ione buckwheat (*Eriogonum apricum* (incl. vars. *apricum* and *prostratum*)
C -- Red Mountain buckwheat (*Eriogonum kelloggii*)
PE -- Southern Mountain wild buckwheat (*Eriogonum kennedyi* var. *austromontanum*)
PE -- Mexican flannelbush (*Fremontondendron mexicanum*)
PT -- Greenhorn adobe-lily (*Fritillaria striata*)
PE -- Otay tarplant (*Hemizonia conjugens*)
C -- Gaviota tarplant (Hemizonia increscens ssp. villosa)
C -- Santa Cruz tarplant (Holocarpha macradenia)
C -- Two-flowered lathyrus (Lathyrus biflorus)
PE -- Pitkin Marsh lily (*Lilium pardalinum* ssp. *pitkinense*)
PE -- Mariposa lupine (*Lupinus citrinus* var. *deflexus*)
C -- Nipomo Mesa lupine (*Lupinus nipomensis*)
PE -- Kelso Creek monkey-flower (*Mimulus shevockii*)
PE -- Willowy monardella (*Monardellla linoides* ssp. *viminea*)

Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

PT -- Spreading navarretia (*Navarretia fossalis*)
PT -- Piute Mountains navarretia (*Navarretia setiloba*)
PT -- Dehesa bear grass (Nolina interrata)
C -- Yreka phlox (*Phlox hirsuta*)
PE -- Yardon's piperia (*Piperia yadonii*)
PE -- Calistoga allocarya (*Plagiobothrys strictus*)
PE -- San Bernadino bluegrass (*Poa atropurpurea*)
PE -- Napa bluegrass (*Poa Napensis*)
PE -- Hickman's potentilla (*Potentilla hickmanii*)
PE -- Parish's alkali grass (*Puccinella parishii*)
C -- Red Mountain stonecrop (*Sedum eastwoodiae*)
C -- Parish's checkerbloom (*Sidalcea hickmanii* ssp. *parishii*)
PE -- Keck's checkermallow (*Sidalcea keckii*)
PE -- Kenwood Marsh checkermallow (*Sidalcea oregana* ssp. *valida*)
C -- Red Mountain catchfly (Silene campanulata ssp. *campanulata*)
PE -- California dandeloin (*Taraxacum californicum*)
C -- Kneeland Prairie penny-cress (*Thlaspi californicum*)
PT -- Hidden Lake bluecurls (*Trichostema austromontanum* ssp. *compactum*)
PE -- Showy Indian clover (*Trifolium amoenum*)
PE -- Monterey clover (*Trifolium trichocalyx*)
PT -- Red Hills vervain (*Verbena californica*)
PT -- Gowen cypress (*Cupressus goveniana* ssp. *goveniana*)

Colorado

E -- Mancos milk-vetch (*Astragalus humillimus*)
E -- Osterhout milk-vetch (*Astragalus osterhoutii*)
E -- Clay-loving wild-buckwheat (*Eriogonum pelinophilum*)
T -- Penland alpine fen mustard (*Eutrema penlandii*)
T -- Dudley Bluffs bladderpod (*Lesquerella congesta*)
E -- Knowlton cactus (*Pediocactus knowltonii*)
E -- Penland beardtongue (*Penstemon penlandii*)
E -- North Park phacelia (*Phacelia formosula*)
T -- Dudley Bluffs twinpod (*Physaria obcordata*)
T -- Uinta Basin hookless cactus (*Sclerocactus glaucus*)
T -- Mesa Verde cactus (*Sclerocactus mesae-verdae*)
T -- Ute ladies'-tresses (*Spiranthes diluvialis*)
C - Sleeping Ute milk-vetch (*Astragalus tortipes*)
C -- Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)
C -- Parachute beardtongue (*Penstemon debilis*)
C -- Graham beardtongue (*Penstemon grahamii*)
C -- White River beardtongue (*Penstemon scariosus* var. *albifluvus*)
C -- DeBeque phacelia (*Phacelia submutica*)

Idaho

T -- Water howellia (*Howellia aquatilis*)
T -- MacFarlane's four-o'clock (*Mirabilis macfarlanei*)
T -- Ute ladies'-tresses (*Spiranthes diluvialis*)
C -- Christ's paintbrush (*Castilleja christii*)

Nevada

Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

T -- Ash Meadows milk-vetch (*Astragalus phoenix*)
T -- Spring-loving centaury (*Centaurium namophilum*)
T -- Ash Meadows sunray (*Enceliopsis nudicaulis* var. *corrugata*)
E -- Steamboat buckwheat (*Eriogonum ovalifolium* var. *williamsiae*)
T -- Ash Meadows gumplant (*Grindelia fraxino-pratensis*)
T -- Ash Meadows ivesia (*Ivesia kingii* var. *eremica*)
T -- Ash Meadows blazing-star (*Mentzelia leucophylla*)
E -- Amargosa niterwort (*Nitrophila mohavensis*)
PT - Sodaville milk-vetch (*Astragalus lentiginosus* var. *sesquimetralis*)
C - Clokey's egg-vetch (*Astragalus oophorus* var. *clokeyanus*)
C -- Sulphur Springs buckwheat (*Eriogonum argophyllum*)
C -- Blue Diamond cholla (Opuntia whipplei var. *multigeniculata*)

Montana
T -- Water howellia (*Howellia aquatilis*)
T -- Ute ladies'-tresses (*Spiranthes diluvialis*)

New Mexico
E -- Sacramento prickly-poppy (*Argemone pleiacantha* ssp. *pinnatisecta*)
E -- Mancos milk-vetch (*Astragalus humillimus*)
T -- Sacramento Mountains thistle (*Cirsium vinaceum*)
T -- Lee pincushion cactus (*Coryphantha sneedii* var. *leei*)
E -- Sneed pincushion cactus (*Coryphantha sneedii* var. *sneedii*)
E -- Kuenzler hedgehog cactus (*Echinocereus fendleri* var. *kuenzleri*)
E -- Lloyd's hedgehog cactus (*Echinocereus lloydii*)
T -- Lloyd's Mariposa cactus (*Echinomastus (= Sclerocactus) mariposensis*)
T -- Zuni (=rhizome) fleabane (*Erigeron rhizomatus*)
T -- Gypsum wild-buckwheat (*Eriogonum gypsophilum*)
E -- Todsen's pennyroyal (*Hedeoma todsenii*)
E -- Holy Ghost ipomopsis (*Ipomopsis sancti-spiritus*)
E -- Knowlton cactus (*Pediocactus knowltonii*)
T -- Mesa Verde cactus (*Sclerocactus mesae-verdae*)
C -- Goodding's onion (*Allium gooddingii*)
C -- Puzzle sunflower (*Helianthus paradoxus*)
PE -- Parish's alkali grass (*Puccinella parishii*)

Oregon
E -- Marsh sandwort (*Arenaria paludicola*)
E -- Applegate's milk-vetch (*Astragalus applegatei*)
T -- Golden paintbrush (*Castilleja levisecta*)
T -- Water howellia (*Howellia aquatilis*)
E -- Western lily (*Lilium occidental*)
E -- Bradshaw's desert-parsley (=lomatium) (*Lomatium bradshawii*)
T -- MacFarlane's four-o'clock (*Mirabilis macfarlanei*)
T -- Nelson's checker-mallow (*Sidalcea nelsoniana*)
E -- Malheur wire-lettuce (*Stephanomeria malheurensis*)
C -- Umpqua mariposa lily (*Calochortus umpquaensis*)
C -- Willamette daisy (*Erigeron decumbens* var. *decumbens*)
C -- Gentner's fritillaria (*Fritillaria gentneri*)

Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

C -- Large-flowered wooly meadowfoam (*Limnanthes floccosa* ssp. *grandiflora*)
C -- Cook's lomatium (*Lomatium cookii*)
C -- Rough popcornflower (*Plagiobothrys hirtus*)
C -- Howell's spectacular thelpody (*Thelypodium howelii* var. *spectabilis*)

Utah
E -- Dwarf bear-poppy (*Arctomecon humilis*)
T -- Welsh's milkweed (*Asclepias welshii*)
T -- Heliotrope milk-vetch (*Astragalus montii*)
T -- Navajo sedge (*Carex specuicola*)
T -- Jones cycladenia (*Cycladenia humilis* var. *jonesii*)
T -- Maguire daisy (*Erigeron maguirei*)
E -- Barneby ridge-cress (=peppercress) (*Lepidium barnebyanum*)
E -- Kodachrome bladderpod (*Lesquerella tumulosa*)
E -- San Rafael cactus (*Pediocactus despainii*)
T -- Siler pincushion cactus (*Pediocactus sileri*)
T -- Winkler cactus (*Pediocactus winkleri*)
E -- Clay phacelia (*Phacelia argillacea*)
T -- Maguire primrose (*Primula maguirei*)
E -- Autumn buttercup (*Ranunculus acriformis* var. *aestivalis*)
T -- Clay reed-mustard (*Schoenocrambe argillacea*)
E -- Barneby reed-mustard (*Schoenocrambe barnebyi*)
E -- Shrubby reed-mustard (=toad-flax cress) (*Schoenocrambe suffrutescens*)
T -- Uinta Basin hookless cactus (*Sclerocactus glaucus*)
E -- Wright fishhook cactus (*Sclerocactus wrightiae*)
T -- Ute ladies'-tresses (*Spiranthes diluvialis*)
T -- Last Chance townsendia (*Townsendia aprica*)
C - Deseret milk-vetch (*Astragalus desereticus*)
C - Horseshoe milk-vetch (*Astragalus equisolensis*)
C - Shem milk-vetch (*Astragalus eremiticus* var.*ampullariodes*)
C - Holmgren milk-vetch (*Astragalus holmgreniorum*)
C -- Aquarius paintbrush (*Castilleja aquariensis*)
C -- Wonderland alice-flower (*Gilia caespitosa*)
PE -- Winkler cactus (*Pediocactus winkleri*)
C -- Graham beardtongue (*Penstemon grahamii*)
C -- White River beardtongue (*Penstemon scariosus* var. *albifluvus*)

Washington
E -- Marsh sandwort (*Arenaria paludicola*)
T -- Golden paintbrush (*Castilleja levisecta*)
T -- Water howellia (*Howellia aquatilis*)
E -- Bradshaw's desert-parsley (=lomatium) (*Lomatium bradshawii*)
T -- Nelson's checker-mallow (*Sidalcea nelsoniana*)
T -- Ute ladies'-tresses (*Spiranthes diluvialis*)
C -- Basalt daisy (*Erigeron basalticus*)
PE --Wenatchee Mountains checkermallow (*Sidalcea oregana* ssp. *calva*)

Wyoming
T -- Ute ladies'-tresses (*Spiranthes diluvialis*)
C -- Small rock-cress (*Arabis pusilla*)

Federally Listed, Proposed, and Candidate Plant Species

E= endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate

C -- Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)
C -- Desert yellowhead (*Yermo xanthocephalus*)

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Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

C = candidate species, FE = federally endangered, FT = federally threatened, PE = proposed endangered, PT = proposed threatened

TYPE	COMMON NAME	GENUS, SPECIES	STATUS
AMPHIBIANS	Boreal toad	*Bufo boreas boreas*	C
	California red-legged frog	*Rana aurora draytonii*	FT
	California tiger salamander	*Ambystoma californiense*	C
	Chiricahua leopard frog	*Rana chiricahuensis*	C
	Columbia Frog (East and West)	*Rana luteiventris*	C
	Desert slender salamander	*Batrachoseps aridis*	FE
	Oregon spotted frog	*Rana pretiosa*	C
	Sonora tiger salamander	*Ambystoma tigrinum stebbinsi*	FE
	Wyoming toad	*Bufo hemiophrys baxteri*	FE
BIRDS	Aleutian Canada goose	*Branta canadensis leucopareia*	FT
	American peregrine falcon	*Falco peregrinus anatum*	FE
	Audubon's crested caracara	*Polyborus plancus audubonii*	FT
	Bald eagle	*Haliaeetus leucocephalus*	FT
	Brown pelican	*Pelecanus occidentalis*	FE
	Cactus ferrunginous pygmy-owl	*Glaucidium brasilianum cactorum*	FE
	California condor	*Gymnogyps californianus*	FE
	Coastal California gnatcatcher	*Polioptila californica californica*	FT
	Eskimo curlew	*Numenius borealis*	FE
	Florida scrub jay	*Aphelocoma coerulescens*	FT
	Inyo California (brown) towhee	*Pipilo crissalis eremophilus*	FT
	Least Bell's vireo	*Vireo bellii pusillus*	FE
	Least tern	*Sterna antillarum*	FE
	Marbled murrelet	*Brachyramphus marmoratus marmoratus*	FT
	Mexican spotted owl	*Strix occidentalis lucida*	FT

Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

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PT = proposed threatened

TYPE	COMMON NAME	GENUS, SPECIES	STATUS
BIRDS	Mountain plover	*Charadrius montanus*	C
	Northern aplomado falcon	*Falco femoralis septentrionalis*	FE
	Northern spotted owl	*Strix occidentalis caurina*	FT
	Peregrine falcon	*Falco peregrinus*	FE
	Piping plover	*Charadrius melodus*	FE/FT
	Red-cockaded woodpecker	*Picoides borealis*	FE
	Short-tailed albatross	*Diomedea albatrus*	FE
	Southwestern willow flycatcher	*Empidonax traillii extimus*	FE
	Spectacled eider	*Somateria fischeri*	FT
	Steller's eider	*Polystricta stelleri*	FT
	Western snowy plover	*Charadrius alexandrinus nivosus*	FT
	Whooping Crane	*Grus americana*	FE
	Wood stork	*Mycteria americana*	FE
	Yuma clapper rail	*Rallus longirostris yumaensis*	FE
CRUSTACEANS	Conservancy fairy shrimp	*Branchinecta conservatio*	FE
	Illinois cave amphipod	*Gammarus acherondytes*	PE
	Socorro isopod	*Exosphaeroma thermophilus*	FE
	Vernal pool tadpole shrimp	*Lepidurus packardi*	FE
	Vernal pool fairy shrimp	*Brachinecta lynchi*	FT
FISH	Arctic grayling	*Thymallus arcticus*	C
	Arkansas darter	*Etheostoma cragini*	C
	Arkansas river shiner	*Notropis girardi*	PE
	Ash Meadows Amargosa pupfish	*Cyprinodon nevadensis mionectes*	FE
	Ash Meadows speckled dace	*Rhinichthys osculus nevadensis*	FE
	Beautiful shiner	*Cyprinella formosa*	FT
	Big Spring spinedace	*Lepidomeda mollispinis pratensis*	FT

Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

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TYPE	COMMON NAME	GENUS, SPECIES	STATUS
FISH	Bonytail chub	*Gila elegans*	FE
	Borax Lake Chub	*Gila boraxobius*	FE
	Bull trout	*Salvelinus confluentus*	PT/PE
	Chihuahua chub	*Gila nigrescens*	FT
	Clover Valley speckled dace	*Rhinichthys osculus oligoporus*	FE
	Coho salmon (Oregon)	*Oncorhynchus kisutch*	FT
	Coho salmon (Central CA)	*Oncorhynchus kisutch*	FT
	Colorado squawfish	*Ptychocheilus lucius*	FE
	Cowhead Lake tui chub	*Gila bicolor vaccaceps*	C
	Cui-ui	*Chasmistes cujus*	FE
	Desert dace	*Eremichthys acros*	FT
	Desert pupfish	*Cyprinodon macularius*	FE
	Devil's Hole pupfish	*Cyprinodon diabolis*	FE
	Fall chinook salmon	*Oncorhynchus tshawytscha*	FT
	Foskett speckled dace	*Rhinichthys osculus* spp. 3	FT
	Gila chub	*Gila intermedia*	C
	Gila trout	*Oncoryhnchus gilae*	FE
	Gila topminnow	*Poeciliopsis occidentalis*	FE
	Greenback cutthroat trout	*Oncorhynchus clarki stomias*	FT
	Gulf sturgeon	*Acipenser oxyrhynchus desotoi*	FT
	Hiko White River springfish	*Crenichthys baileyi grandis*	FE
	Humpback chub	*Gila cypha*	FE
	Hutton tui chub	*Gila bicolor* spp. 1	FT
	Independence Valley speckled dace	*Rhinichthys osculus lethoporus*	FE
	June sucker	*Chasmistes liorus*	FE

Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

C = candidate species, FE = federally endangered, FT = federally threatened, PE = proposed endangered, PT = proposed threatened

TYPE	COMMON NAME	GENUS, SPECIES	STATUS
FISH	Kendall Warm Springs dace	*Rhinichthys osculus thermalis*	FE
	Kootenai River white sturgeon	*Acipenser transmontanus*	FE
	Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	FT
	Least chub	*Lotichthys phlegethontis*	PE
	Little Colorado spinedace	*Lepidomeda vittata*	FT
	Loach minnow	*Rhinichthys (Tiaroga) cobitis*	FT
	Lost River sucker	*Deltistes (Catostomus) luxatus*	FE
	Moapa dace	*Moapa coriacea*	FE
	Modoc sucker	*Catostomus microps*	FE
	Mohave tui chub	*Gila bicolor mohavensis*	FE
	Nevada speckled dace	*Rhinichthys osculus nevadensis*	FE
	Okaloosa darter	*Etheostoma okaloosae*	FE
	Oregon chub	*Oregonichtys (Hybopsis) crameri*	FE
	Owens pupfish	*Cyprinodon radiosus*	FE
	Owens tui chub	*Gila bicolor snyderi*	FE
	Pahranagat roundtail chub	*Gila robusta jordani*	FE
	Pahrump killifish	*Empetrichthys latos*	FE
	Paiute cutthroat trout	*Oncorhynchus clarki seleniris*	FT
	Pallid sturgeon	*Scaphirhynchus albus*	FE
	Pecos bluntnose shiner	*Notropis simus pecosensis*	FT
	Pecos gambusia	*Gambusia nobilis*	FE
	Pecos pupfish	*Cyprinodon pecosensis*	PE
	Railroad Valley springfish	*Crenichthys nevadae*	FT
	Razorback sucker	*Xyrauchen texanus*	FE
	Rio Grande silvery minnow	*Hybognathus amarus*	FE
	Shortnose sucker	*Chasmistes brevirostris*	FE

Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

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TYPE	COMMON NAME	GENUS, SPECIES	STATUS
FISH	Sicklefin chub	*Macrhybopsis meeki*	C
	Sockeye salmon	*Oncorhynchus nerka*	FE
	Sonora chub	*Gila ditaenia*	FT
	Spikedace	*Meda fulgida*	FT
	Spring/summer chinook salmon	*Oncorhynchus tschawytscha*	FT
	Steelhead trout	*Oncorhynchus mykiss*	FE/FT
	Sturgeon chub	*Macrhybopsis gelida*	C
	Umpqua River cutthroat trout	*Oncorhynchus clarki clarki*	FE
	Unarmored three-spine stickleback	*Gasterosteus aculeatus williamsoni*	FE
	Virgin River chub	*Gila robusta seminuda*	FE
	Warm Springs Amargosa pupfish	*Cyprinodon nevadensis pectoralis*	FE
	Warner sucker	*Catostomus warnerensis*	FT
	White River spinedace	*Lepidomeda albivallis*	FE
	White River springfish	*Crenichthys baileyi baileyi*	FE
	Winter-run Chinook Salmon	*Oncorhynchus tschawytscha*	FE
	Woundfin	*Plagopterus argentissimus*	FE
	Yaqui catfish	*Ictalurus pricei*	FT
	Yaqui chub	*Gila purpurea*	FE
	Yaqui topminnow	*Poeciliopsis occidentalis sonoriensis*	FE
INSECTS AND ARTHROPODS	American burying beetle	*Nicrophorus americanus*	FE
	Ash Meadows naucorid bug	*Ambrysus amargosus*	FT
	Coral pink sand dunes tiger beetle	*Cicindela limbata albissima*	C
	Delta sands flower-loving fly	*Rhaphiomidas terminatus abdominalis*	FE
	Fender's blue butterfly	*Icaricia icarioides fenderi*	PE
	Holsinger's cave beetle	*Pseudanophthalmus holsingeri*	C

Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

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TYPE	COMMON NAME	GENUS, SPECIES	STATUS
Insects and Arthropods	Karner blue butterfly	*Lycaeides melissa samuelis*	FE
	Kern primrose sphinx moth	*Euproserpinus euterpe*	FT
	Kincaid's lupine	*Lupinus sulphureus* ssp. *Kincaidii*	PT
	Oregon's silverspot butterfly	*Speyeria zerene hippolyta*	FT
	Pawnee montane skipper	*Hesperia leonardus montana*	FT
	Uncomphagre fritillary butterfly	*Boloria acrocnema*	FE
	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT
Mammals	Alabama beach mouse	*Peromyscus polionotus ammobates*	FE
	Amargosa vole	*Microtus californicus scirpensis*	FE
	Black-footed ferret	*Mustela nigripes*	FE
	Blue whale	*Balaenoptera musculus*	FE
	Chocawhatchee beach mouse	*Peromyscus polionotus allophrys*	FE
	Columbian white-tailed deer	*Odocoileus virginianus leucurus*	FE
	Finback whale	*Balaenoptera physalus*	FE
	Florida black bear	*Ursus americanus floridanus*	C
	Florida panther	*Felis concolor coryi*	FE
	Fresno kangaroo rat	*Dipodomys nitratoides exilis*	FE
	Giant kangaroo rat	*Dipodomys* ingens	FE
	Gray bat	*Myotis grisescens*	FE
	Gray whale	*Eschrichtius robustus*	FE
	Gray wolf	*Canis lupis*	FE
	Grizzly (brown) bear	*Ursus arctos*	FT
	Hualapai Mexican vole	*Microtus mexicanus hualapaiensis*	FE
	Humpback whale	*Megaptera novaeangliae*	FE
	Idaho ground squirrel	*Spermophilus brunneus*	PT

Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

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TYPE	COMMON NAME	GENUS, SPECIES	STATUS
MAMMALS	Indiana bat	*Myotis sodalis*	FE
	Jaguar	*Panthera onca*	FE
	Jaguarundi	*Felis yagouaroundi*	FE
	Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	FE
	Lower Keys marsh rabbit	*Sylvalagus palustirs hefneri*	FE
	Manatee (West Indian)	*Trichechus manatus*	FE
	Mexican gray wolf	*Canis lupus* baileyi	FE
	Mexican long-nosed bat	*Leptonycteris nivalis*	FE
	North American wolverine	*Gulo gulo luscus*	C
	North American lynx	*Lynx canadensis*	C
	Ocelot	*Felis pardalis*	FE
	Perdido Key beach mouse	*Peromyscus polioonotus trissyllepsis*	FE
	Peninsular bighorn sheep	*Ovis canadensis cremnobates*	FE
	Peninsular pronghorn	*Antilocapra americana peninsularis*	FE
	Right whale	*Balaena glacialis*	FE
	Saint Andrew's beach mouse	*Peromyscus polionotus penninsularis*	PE
	San Joaquin kit fox	*Vulpes macrotis mutica*	FE
	San Joaquin Valley woodrat	*Neotoma fuscipes riparia*	PE
	Sei whale	*Balaenoptera* borealis	FE
	Silver rice rat	*palustris natator*	FE
	Sonoron pronghorn	*Antilocapra americana sonoriensis*	FE
	Southern sea otter	*Enhydra lutris nereis*	FT
	Sperm whale	*Physeter macrocephalus*	FE
	Steller (Northern) sea lion	*Eumetopias jubatus*	FT
	Stephen's kangaroo rat	*Dipodomys stephensi*	FE
	Swift fox	*Vulpes velox*	C

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Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

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TYPE	COMMON NAME	GENUS, SPECIES	STATUS
	Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	FE
	Utah prairie dog	*Cynomys parvidens*	FT
	Woodland caribou	*Rangifer tarandus caribou*	FE
REPTILES	American alligator	*Alligator mississippiensis*	FT
	Black legless lizard	*Anniella pulchra nigra*	PE
	Blunt-nosed leopard lizard	*Gambelia silus*	FE
	Bog turtle	*Clemmys muhlenbergii*	FT
	Coachella Valley fringe-toed lizard	*Uma inornata*	FT
	Desert tortoise (Mojave)	*Gopherus agassizii*	FT
	Eastern indigo snake	*Drymarchon corais couperi*	FT
	Giant garter snake	*Thamnophis gigas*	FT
	Gopher tortoise	*Gopherus polyphemus*	FT
	Green sea turtle	*Chelonia mydas*	FE/FT
	Lake Erie water snake	*Nerodia sipedon insularum*	PT
	Leatherback sea turtle	*Dermochelys coriaccea*	FE
	Loggerhead sea turtle	*Caretta caretta*	FT
	New Mexican ridge-nosed rattlesnake	*Crotalus willardi obscurus*	FT
	Northern copperbelly water snake	*Nerodia erythrogaster neglecta*	FT
	Olive-Ridley sea turtle	*Lepidochelys olivacea*	FT
	Wyoming toad	*Bufo hemiophyrs baxteri*	FE
MUSSELS AND SNAILS	Alamosa springsnail	*Tryonia alamosae*	FE
	Banbury Springs limpet	*Lanx* spp.	FE
	Bliss Rapids snail	*Taylorconcha serpenticola*	FT
	Bruneau Hot Springsnail	*Pyrgulopsis bruneauensis*	FE

Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

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TYPE	COMMON NAME	GENUS, SPECIES	STATUS
MUSSELS AND SNAILS	Cave snail	*Antrobia culveri*	C
	Chipola slabshell	*Elliptio chipolaensis*	FT
	Chupadera springsnail	*Prygulopsis chupaderae*	C
	Clubshell mussel	*Pleuobema clava*	FE
	Cumberland elktoe	*Alasmindonta atropurpurea*	FE
	Cumberlandian combshell	*Epioblasma brevidans*	FE
	Cylindrical lioplax	*Lioplax cyclostomaformis*	PE
	Fat three ridge mussel	*Amblema meislerii*	FE
	Fat-whorled pondsnail	*Stagnicola bonnevillensis*	C
	Flat pebblesnail	*Lepyrium showalteri*	PE
	Gila springsnail	*Prygulopsis gilae*	C
	Gulf moccainshell	*Medionidus penicillatus*	FE
	Huachuca springsnail	Pyrgulopsis thompsoni	C
	Idaho springsnail	*Fontelicella idahoensis*	FE
	Kanab ambersnail	*Oxyloma haydeni kanabensis*	FE
	Koster's tryonia	*Tryonia kosteri*	C
	Lacy elimia	*Elimia crenatella*	PT
	New Mexico hotspringsnail	*Prygulopsis thermalis*	C
	Ochckonee moccainshell	*Medionidus simpsonianus*	FE
	Ogden Deseret mountainsnail	*Oreohelix peripherica wasatchensis*	C
	Oval pigtoe	*Pleurobema pyeiforme*	FE
	Oyster mussel	*Epionlasma capsaeformis*	FE
	Page springsnail	*Pyrgulopsis morrisoni*	C
	Painted rocksnail	*Leptoxis taeniata*	PT
	Pecos assiminea snail	Assiminea pecos	C

Federally Listed, Proposed, and Candidate Fish and Wildlife Species On BLM-Managed Lands

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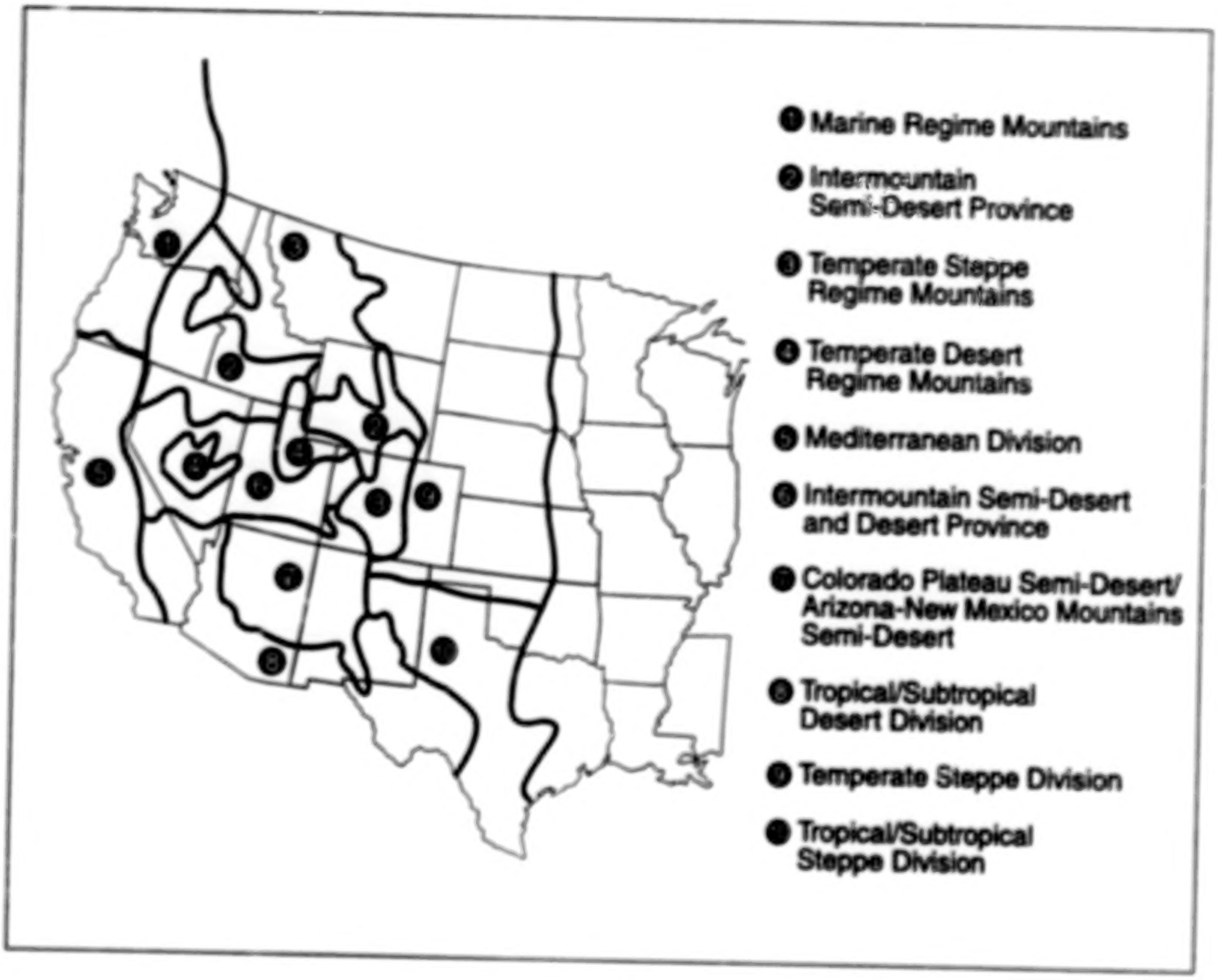
TYPE	COMMON NAME	GENUS, SPECIES	STATUS
MUSSELS AND SNAILS	Plicate rocksnail	Leptoxis plicata	PE
	Purple bankclimber	Elliptoideus sloatianus	FT
	Purple bean	Villosa perpurpurea	FE
	Roswell springsnail	Prygulopsis roswellensis	C
	Rough rabbitsfoot	Quadrula cylindrica strigillata	FE
	Round rocksnail	*Leptoxis ampla*	PT
	San Xavier talussnail	*Sonorella eremita*	PE
	Shiny-rayed pocketbook	*Lampsilis subangulata*	FE
	Snake River physa snail	*Physa natricina*	FE
	Socorro springsnail	*Prygulopsis neomexicana*	FE
	Utah valvata snail	*Valvata utahensis*	FE
	Wet Canyon talussnail	*Sonorella macrophallus*	C

Amphibians and Reptiles Designated as Sensitive Species by BLM State Offices

Amargosa toad
Arizona toad
Arizona skink
Banded Gila monster
Blanchard's cricket frog
California king snake
Canadian toad
Canyon spotted whiptail
Canyon whiptail
Cascades frog
Chuckwalla
Coeur d'Alene salamander
Collard lizard (Mojave black)
Common kingsnake
Cowles fringe-toed lizard
Desert night lizard
Desert spiny lizard
Desert iguana
Desert tortoise (Sonoran Desert)
Desert glossy snake
Desert horned lizard
Dunes sagebrush lizard
Eastern short-horned lizard
Flat-tailed horned lizard
Glen Canyon chuckwalla
Gray-checkered whiptail
Great Plains rat snake
Jemez Mountain salamander
Larch Mountain salamander
Longnose leopard lizard
Lowland leopard frog
Massasauga
Mexican garter snake
Midget-faded rattlesnake
Milk snake
Mojave black-collard lizard
Mojave Desert sidewinder
Mojave patch-nosed snake
Narrow-headed garter snake
Narrowhead garter snake
Northern leopard frog
Northern red-legged frog
Northern sagebrush lizard
Northwestern pond turtle
Pacific chorus frog
Painted Desert glossy snake
Plains leopard frog
Plateau striped whiptail
Ringneck snake
Rosy boa
Sacramento Mountain salamander
Smooth green snake
Snapping turtle
Sonora lyre snake
Sonora tiger salamander
Southern torrent salamander
Southwestern black snake
Southwestern speckled rattlesnake
Spiny softshell turtle
Spotted frog
Tailed frog
Tarahumara frog
Texas horned lizard
Utah banded gecko
Utah blind snake
Utah milk snake
Utah mountain king snake
Western toad
Western chuckwalla
Western ground snake
Wood frog

Matrix of Regional Priority Bat Species Developed by the Bat Working Group (1998)						
Species	Region 1	Region 2	Regions 3, 4, 9, 10	Region 5	Region 6	Regions 7, 8
MULTIPLE HABITAT BATS						
Southwestern myotis						M
California myotis	L	M	L	L	M	L
Western small-footed myotis	P	M	L	M	M	M
Long-eared myotis	M	M	L	M	M	M
Keen's myotis	H					
Little brown bat	L	L	L	M	M	M
Arizona myotis						M
Northern myotis			L			
Fringed myotis	H	H	M	H	H	M
Long-legged myotis	M	M	L	H	L	M
Yuma myotis	L	M	L	L	M	L
Big brown bat	L	L	L	L	L	L
Lappet-eared bat					H	H
Pallid bat	H	M	L	H	M	L
Mexican free-tailed bat	L		L	L	M	L
TREE-ROOSTING BATS						
Western red bat				H	H	H
Eastern red bat			L			
Hoary bat	M	M	M	M	M	M
Western yellow bat				H	[illegible]	H
Silver-haired bat	M	M	M	M	M	M
H = high priority; M = medium priority; L = low priority; P = periphery (species on the edge of its range).						

Matrix of Regional Priority Bat Species Developed by the Bat Working Group (1998)						
Species	Region 1	Region 2	Regions 3, 4, 9, 10	Region 5	Region 6	Regions 7, 8
CLIFF-ROOSTING BATS						
Western pipestrelle	P	L	L	L	M	L
Spotted bat	P	H	M	H	H	M
Pocketed free-tailed bat				M		M
Big free-tailed bat			L	M	H	M
Western mastiff bat				H	H	M
Underwood's mastiff bat						M
CAVE-ROOSTING BATS						
Ghost-faced bat						M
California leaf-nosed bat				H		H
Mexican long-tongued bat				M		H
Lesser long-nosed bat						H
Big long-nosed bat						H
Cave myotis			L			M
Townsend's big-eared bat	H	H	H	H	H	H
H = high priority; M = medium priority; L = low priority; P = periphery (species on the edge of its range).						


❶ Marine Regime Mountains
❷ Intermountain Semi-Desert Province
❸ Temperate Steppe Regime Mountains
❹ Temperate Desert Regime Mountains
❺ Mediterranean Division
❻ Intermountain Semi-Desert and Desert Province
❼ Colorado Plateau Semi-Desert/ Arizona-New Mexico Mountains Semi-Desert
❽ Tropical/Subtropical Desert Division
❾ Temperate Steppe Division
❿ Tropical/Subtropical Steppe Division

Priority Bat Species Regions Used by Bat Working Group (1998).

Partners In Flight Western Working Group Group
Priority Bird Species in the Western U.S.
177 species on the list of one or more, e.g. (3) states

10 October 1997

Abert's Towhee
American Pipit
American Redstart
American Bittern
Aplomado Falcon
Arctic Warbler
Baird's Sparrow (3)
Bald Eagle (3)
Band-tailed Pigeon (3)
Bank Swallow (3)
Bell's Vireo (5)
Belted Kingfisher
Bendire's Thrasher (2)
Black-billed Cuckoo
Black-throated Gray Warbler (5)
Black Swift (5)
Black Rail
Black Tern (2)
Black-throated Sparrow (2)
Black-backed Woodpecker
Black-chinned Sparrow
Black-shouldered Kite
Blackpoll Warbler
Blue Grosbeak (2)
Blue Grouse
Blue-gray Gnatcatcher
Blue-throated Hummingbird
Bobolink (2)
Bohemian Waxwing
Boreal Owl (2)
Botteri's Sparrow (2)
Brewer's Sparrow (7)
Broad-billed Hummingbird
Brown Pelican (California)
Brown-capped Rosy Finch
Brown Creeper
Buff-breasted Flycatcher
Burrowing Owl (8)
Caspian Tern
Cassin's Sparrow (2)
Cassin's Vireo
Chestnut-collared Longspur (3)
Chestnut-backed Chickadee
Chipping Sparrow
Common Yellowthroat (2)
Common Ground Dove
Common Black-Hawk (2)
Common Tern
Cooper's Hawk (2)
Cordilleran Flycatcher (4)
Costa's Hummingbird
Dickcissel
Eastern Bluebird
Elegant Trogon (2)
Elf Owl
Ferruginous Hawk (10)
Ferruginous Pygmy-Owl
Flammulated Owl (2)
Forster's Tern
Franklin's Gull
Gila Woodpecker
Golden-crowned Kinglet (2)
Golden Eagle
Grace's Warbler (4)
Grasshopper Sparrow (4)
Gray Catbird (2)
Gray Flycatcher (6)
Gray Hawk
Gray Vireo (6)
Gray-cheeked Thrush
Greater Pewee
Greater Prairie-Chicken
Green-tailed Towhee
Gyrfalcon
Hammond's Flycatcher (6)
Harlequin Duck
Harris' Hawk
Hermit Warbler
Hooded Oriole
Lark Bunting (3)
Le Conte's Thrasher (2)
Least Flycatcher
Least Tern (4)
Lesser Prairie-Chicken (2)
Lewis' Woodpecker (5)
Lincoln's Sparrow
Loggerhead Shrike (6)
Long-billed Curlew (7)
Long-eared Owl (2)
Lucifer Hummingbird
Lucy's Warbler (4)
MacGillivray's Warbler (7)
Marsh Wren
McCown's Longspur (3)
McKay's Bunting
Montezuma Quail
Mountain Plover (5)
Mountain Bluebird
Northern Beardless-Tyrannulet
Northern Goshawk (6)
Northern Harrier
Northern Shrike
Northern Waterthrush
Northwestern Crow
Olive-sided Flycatcher (11)
Olive Warbler
Orange-crowned Warbler
Orchard Oriole
Osprey
Pacific-slope Flycatcher
Painted Bunting
Peregrine Falcon (3)
Phainopepla
Pileated Woodpecker
Pinyon Jay
Piping Plover (2)
Prairie Falcon
Purple Martin (2)
Red-breasted Sapsucker
Red-eyed Vireo (2)
Red-naped Sapsucker (5)
Red-faced Warbler (2)
Red-headed Woodpecker
Red-shouldered Hawk
Rock Wren
Rufous Hummingbird (3)
Rufous-winged Sparrow
Rusty Blackbird
Sage Grouse (2)
Sage Sparrow (7)
Sage Thrasher (2)
Sandhill Crane (2)
Savannah Sparrow (2)
Scott's Oriole (2)
Sharp-shinned Hawk

Sharp-tailed Grouse (Columbian)
Short-eared Owl (2)
Siberian Tit
Smith's Longspur
Snowy Plover (4)
Spotted Owl (2)
Sprague's Pipit (2)
Summer Tanager (3)
Swainson's Hawk (2)
Swainson's Thrush
Thick-billed Kingbird
Three-toed Woodpecker
Townsend's Warbler (4)
Tree Swallow
Tricolored Blackbird
Trumpeter Swan
Upland Sandpiper (3)
Varied BuntingVaried Thrush (2)
Vaux's Swift (5)
Veery (2)
Virginia's Warbler (6)
Warbling Vireo
Western Bluebird
Western Wood-Pewee
Western Screech-Owl
Whip-poor-will
Whiskered Screech-Owl
White-headed Woodpecker
Vermillion Flycatcher (2)
Violet-crowned Hummingbird (2)

Appendix G
Economics

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Methodology for Estimating the Contribution of Locatable Mineral Production to the Economies of the 12 Western States A-196

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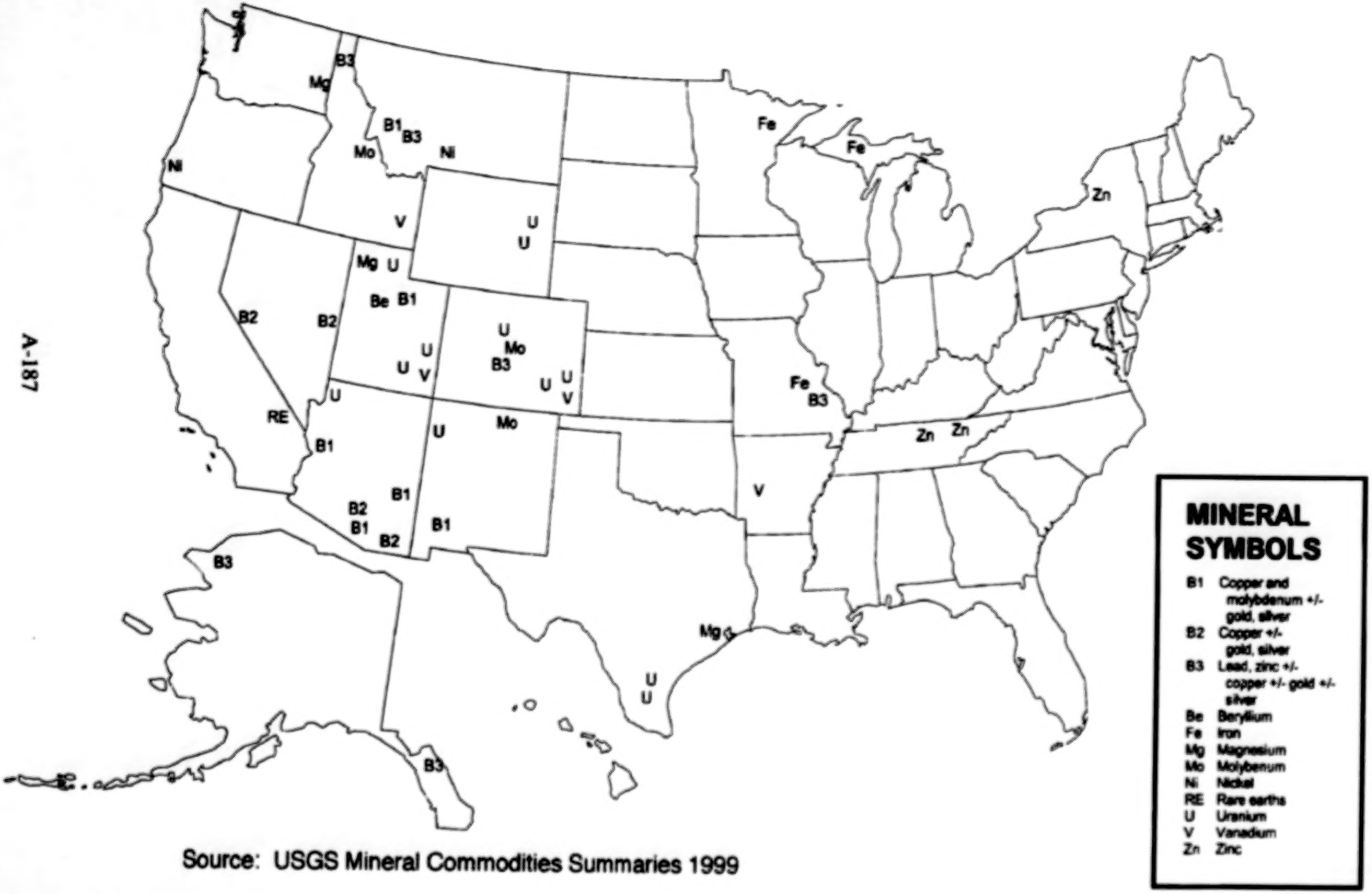
Figure G-1

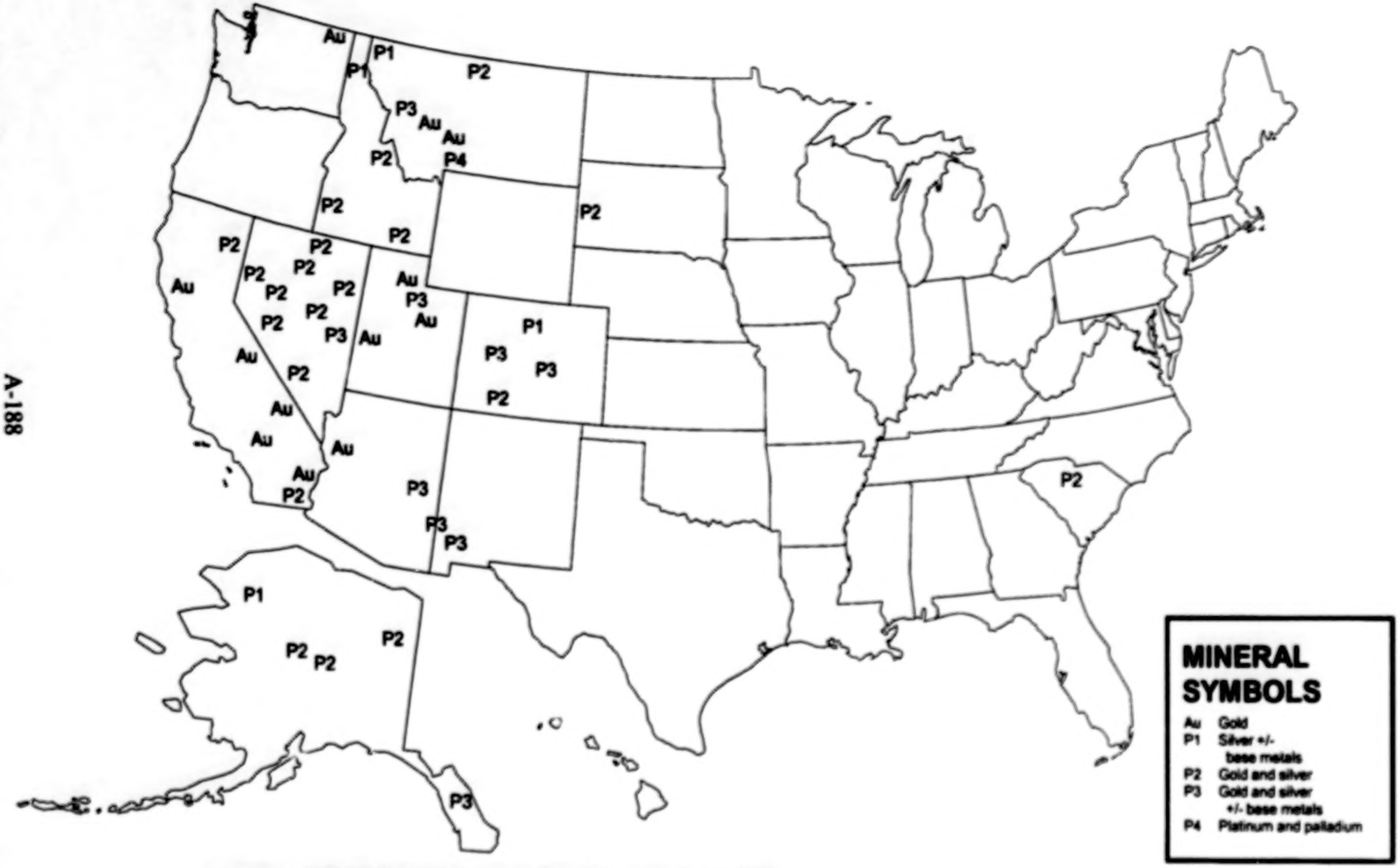
MAJOR BASE AND FERROUS METAL PRODUCING AREAS



Source: USGS Mineral Commodities Summaries 1999

Figure G-2

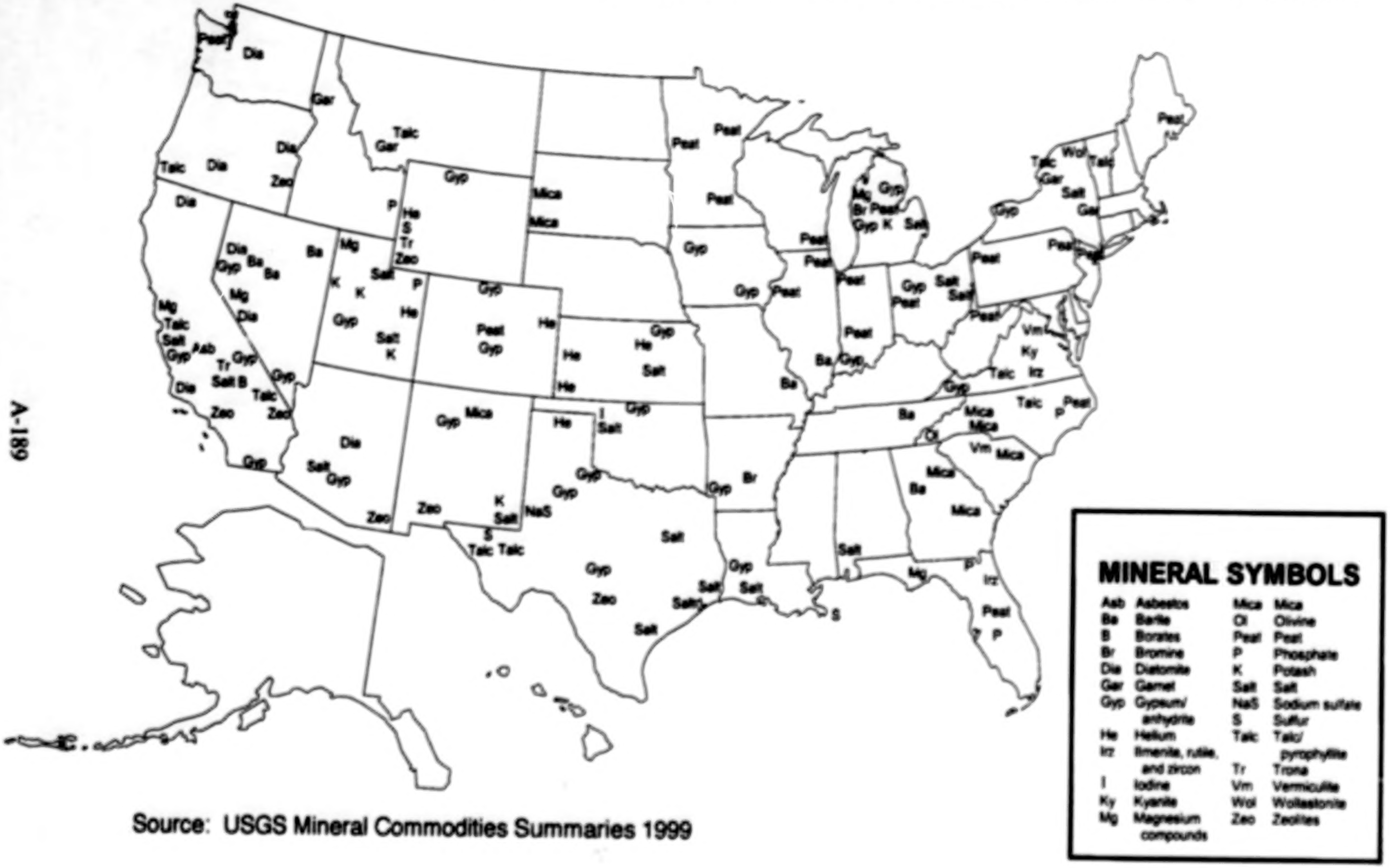
MAJOR PRECIOUS METAL PRODUCING AREAS



Source: USGS Mineral Commodities Summaries 1999

Figure G-3

MAJOR INDUSTRIAL ROCK AND MINERAL PRODUCING AREAS - PART I



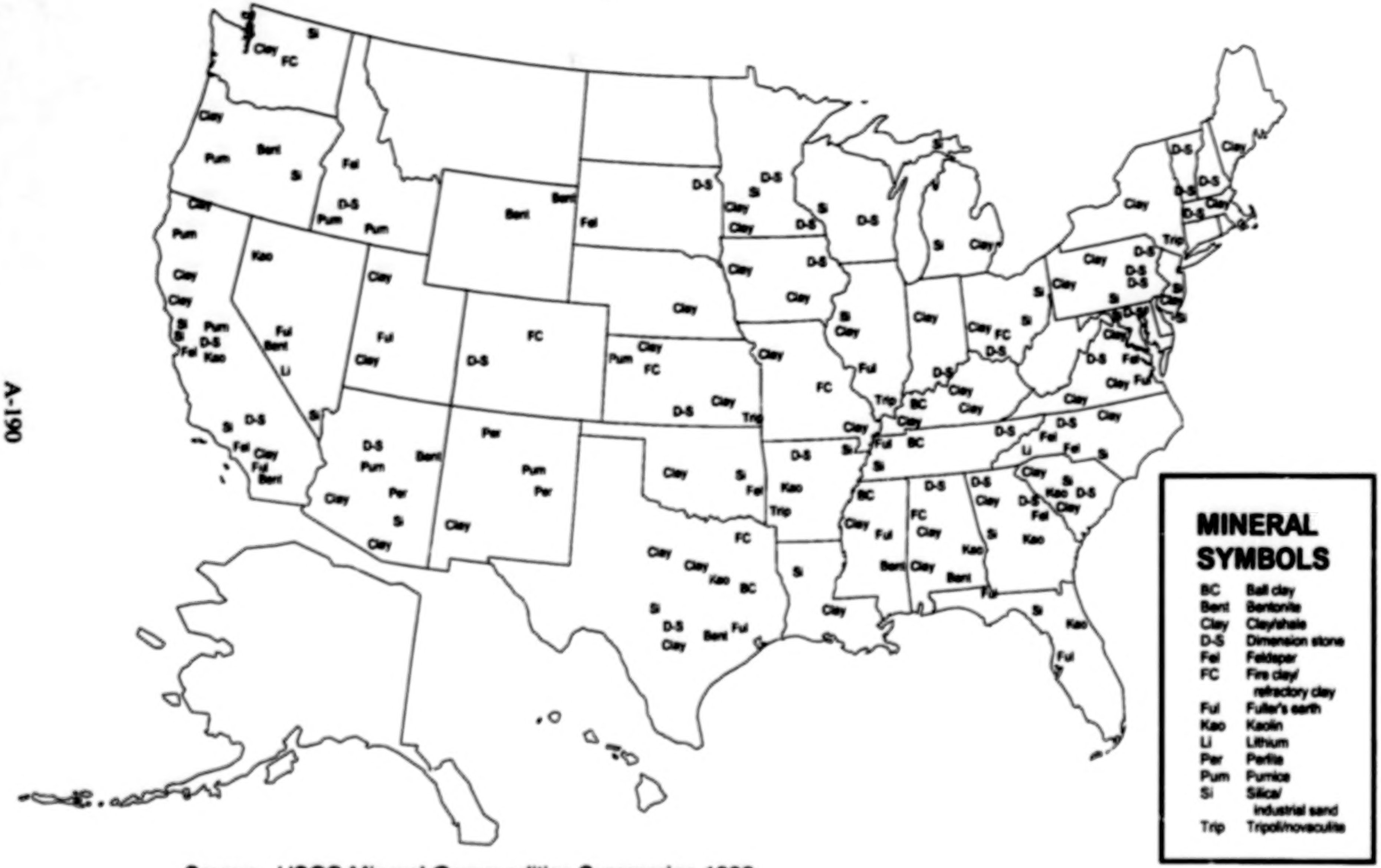
MINERAL SYMBOLS

Asb	Asbestos	Mica	Mica
Ba	Barite	Ol	Olivine
B	Borates	Peat	Peat
Br	Bromine	P	Phosphate
Dia	Diatomite	K	Potash
Gar	Garnet	Salt	Salt
Gyp	Gypsum/ anhydrite	NaS	Sodium sulfate
He	Helium	S	Sulfur
Irz	Ilmenite, rutile, and zircon	Talc	Talc/ pyrophyllite
I	Iodine	Tr	Trona
Ky	Kyanite	Vm	Vermiculite
Mg	Magnesium compounds	Wol	Wollastonite
		Zeo	Zeolites

Source: USGS Mineral Commodities Summaries 1999

Figure G-4

MAJOR INDUSTRIAL ROCK AND MINERAL PRODUCING AREAS - PART II



Source: USGS Mineral Commodities Summaries 1999

Table G-1. Gross State Product (GSP) for Study Area 1982-1996 (millions of chained 1996 dollars)

State	1982	% of 1982 State Total	1990	% of 1990 State	1996	% of 1996 State Total	Percent Change 1982-1996
Alaska							
Total Gross State Product	$25,800	100.0%	$28,400	100.0%	$24,200	100.0%	-6.4%
Mining	6,070	23.5%	9,640	33.9%	5,420	22.4%	-10.6%
Metal mining	6	0.0%	197	0.7%	176	0.7%	2616.7%
Nonmetallic minerals, except fuels	7	0.0%	10	0.0%	19	0.1%	157.1%
Arizona							
Total Gross State Product	54,400	100.0%	79,200	100.0%	112,000	100.0%	104.9%
Mining	494	0.9%	839	1.1%	1,480	1.3%	199.4%
Metal mining	438	0.8%	719	0.9%	1,260	1.1%	187.9%
Nonmetallic minerals, except fuels	27	0.1%	38	0.0%	83	0.1%	203.7%
California							
Total Gross State Product	623,000	100.0%	925,000	100.0%	963,000	100.0%	54.5%
Mining	6,350	1.0%	6,340	0.7%	5,780	0.6%	-9.0%
Metal mining	70	0.0%	214	0.0%	289	0.0%	310.8%
Nonmetallic minerals, except fuels	382	0.1%	697	0.1%	903	0.1%	136.5%
Colorado							
Total Gross State Product	73,800	100.0%	85,900	100.0%	116,000	100.0%	57.4%
Mining	1,450	2.0%	1,750	2.0%	1,940	1.7%	33.8%
Metal mining	211	0.3%	90	0.1%	114	0.1%	-45.9%
Nonmetallic minerals, except fuels	41	0.1%	49	0.1%	140	0.1%	245.0%
Idaho							
Total Gross State Product	15,900	100.0%	19,900	100.0%	27,900	100.0%	75.5%
Mining	153	1.0%	206	1.0%	174	0.6%	13.6%
Metal mining	85	0.5%	114	0.6%	95	0.3%	11.5%
Nonmetallic minerals, except fuels	63	0.4%	95	0.5%	77	0.3%	22.2%
Montana							
Total Gross State Product	15,100	100.0%	15,200	100.0%	18,500	100.0%	22.5%
Mining	719	4.8%	737	4.8%	903	4.9%	25.6%
Metal mining	85	0.6%	161	1.1%	272	1.5%	219.0%
Nonmetallic minerals, except fuels	40	0.3%	72	0.5%	66	0.4%	66.7%
Nevada							
Total Gross State Product	23,400	100.0%	36,800	100.0%	53,700	100.0%	129.5%
Mining	314	1.3%	1,090	3.0%	1,970	3.7%	526.5%
Metal mining	216	0.9%	967	2.6%	1,830	3.4%	747.7%
Nonmetallic minerals, except fuels	94	0.4%	91	0.2%	133	0.2%	40.9%
New Mexico							
Total Gross State Product	26,600	100.0%	29,500	100.0%	42,700	100.0%	60.7%
Mining	2,860	10.8%	2,710	9.2%	3,050	7.1%	6.6%
Metal mining	169	0.6%	216	0.7%	180	0.4%	6.4%
Nonmetallic minerals, except fuels	124	0.5%	176	0.6%	319	0.7%	156.9%
Oregon							
Total Gross State Product	50,900	100.0%	66,500	100.0%	87,000	100.0%	70.8%
Mining	59	0.1%	87	0.1%	104	0.1%	75.0%
Metal mining	8	0.0%	5	0.0%	3	0.0%	-60.0%
Nonmetallic minerals, except fuels	42	0.1%	75	0.1%	99	0.1%	133.3%

Table G-1. Gross State Product (GSP) for Study Area 1982-1996 (millions of chained 1996 dollars)

State	1982	% of 1982 State Total	1990	% of 1990 State	1996	% of 1996 State Total	Percent Change 1982-1996
Utah							
Total Gross State Product	28,300	100.0%	36,000	100.0%	50,400	100.0%	77.7%
Mining	682	2.4%	1,360	3.8%	1,620	3.2%	137.5%
Metal mining	163	0.6%	285	0.8%	684	1.4%	318.5%
Nonmetallic minerals, except fuels	51	0.2%	87	0.2%	30	0.1%	-40.8%
Washington							
Total Gross State Product	99,800	100.0%	136,000	100.0%	160,000	100.0%	59.9%
Mining	111	0.1%	251	0.2%	332	0.2%	198.3%
Metal mining	30	0.0%	66	0.0%	53	0.0%	75.0%
Nonmetallic minerals, except fuels	67	0.1%	136	0.1%	222	0.1%	231.8%
Wyoming							
Total Gross State Product	13,900	100.0%	14,200	100.0%	16,800	100.0%	20.8%
Mining	3,250	23.3%	4,460	31.3%	5,320	31.6%	63.7%
Metal mining	117	0.8%	27	0.2%	19	0.1%	-83.8%
Nonmetallic minerals, except fuels	369	2.6%	589	4.1%	754	4.5%	104.4%
Study Area							
Total Gross State Product	1,050,000	100.0%	1,470,000	100.0%	1,670,000	100.0%	59.0%
Mining	22,100	2.1%	28,900	2.0%	28,100	1.7%	27.3%
Metal mining	1,590	0.2%	3,060	0.2%	4,970	0.3%	212.1%
Nonmetallic minerals, except fuels	1,310	0.1%	2,110	0.1%	2,850	0.2%	117.7%
Metals, nonmetals combined	2,900	0.3%	5,170	0.4%	7,820	0.5%	169.6%
U.S. (GDP)							
Total Gross Domestic Product	5,030,000	100.0%	6,660,000	100.0%	7,630,000	100.0%	51.8%
Mining	87,800	1.7%	108,000	1.6%	114,000	1.5%	29.4%
Metal mining	2,350	0.0%	3,970	0.1%	6,840	0.1%	190.9%
Nonmetallic minerals, except fuels	5,070	0.1%	7,830	0.1%	10,200	0.1%	100.6%
Metals, nonmetals combined	$7,420	0.1%	$11,800	0.2%	$17,000	0.2%	129.2%
Study Area as % of U.S. Total							
Total GSP	20.9%	N/A	22.1%	N/A	21.9%	N/A	4.7%
Mining	25.1%	N/A	26.8%	N/A	24.7%	N/A	-1.6%
Metal mining	67.8%	N/A	77.1%	N/A	72.7%	N/A	7.3%
Nonmetallic minerals, except fuels	25.8%	N/A	27.0%	N/A	28.0%	N/A	8.5%
Metals, nonmetals combined	39.1%	N/A	43.9%	N/A	46.0%	N/A	17.6%

Source: U.S. Department of Commerce, Bureau of Economic Analysis 1998.

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Table G-2. Personal Income and Employment in Study Area, 1980, 1990, 1996 (million 1996 dollars)

Category	1980	1990	1996
PERSONAL INCOME			
Total Personal Income			
Study Area Total	$891,000	$1,240,000	$1,390,000
U.S. Total	$4,350,000	$5,750,000	$6,480,000
Study Area as Percent of U.S. Total	20.5%	21.5%	21.5%
Personal Income - Metal Mining			
Study Area Total	$3,660	$1,940	$2,360
U.S. Total	$6,030	$2,740	$3,260
Study Area as Percent of U.S. Total	60.6%	70.9%	72.5%
Personal Income - Nonmetallic Minerals, except fuels			
Study Area Total	$1,320	$1,140	$1,110
U.S. Total	$5,110	$5,070	$4,900
Study Area as Percent of U.S. Total	25.8%	22.4%	22.6%
Personal Income - Metals, Nonmetals combined			
Study Area Total	$4,980	$3,080	$3,470
U.S. Total	$11,100	$7,810	$8,160
Study Area as Percent of U.S. Total	44.7%	39.4%	42.5%
EMPLOYMENT (000)			
Total Employment			
Study Area Total	22,300	29,500	32,700
U.S. Total	114,000	139,000	152,000
Study Area as Percent of U.S. Total	19.6%	21.2%	21.5%
Employment - Mining			
Study Area Total	245	203	181
U.S. Total	1,280	1,040	880
Study Area as Percent of U.S. Total	19.2%	19.5%	20.6%
POPULATION (000)			
Study Area Total	42,500	52,000	57,300
U.S. Total	227,000	249,000	265,000
Study Area as Percent of U.S. Total	18.7%	20.8%	21.6%

Notes: All figures rounded to three significant digits. Mining employment not available for metal and nonmetal subsectors.

Source: US Department of Commerce, Bureau of Economic Analysis 1998.

Table G-3. Employment Trends in Study Area, 1980-1996

State	1980	Percent of 1980 Total	1990	Percent of 1990 Total	1996	Percent of 1996 Total	Percent Change 1980-1996
Alaska							
Total	169,000	100.0%	233,000	100.0%	257,000	100.0%	52.5%
Total Private	115,000	68.5%	165,000	70.8%	189,000	73.6%	63.8%
Mining	6,680	4.0%	11,400	4.9%	9,620	3.7%	43.9%
Metal Mining	320	0.2%	1,060	0.5%	1,040	0.4%	225.9%
Nonmetallic minerals	0	N/A	0	N/A	0	N/A	N/A
Arizona							
Total	1,020,000	100.0%	1,500,000	100.0%	1,890,000	100.0%	86.1%
Total Private	825,000	81.0%	1,240,000	82.8%	1,600,000	84.7%	94.4%
Mining	21,100	2.1%	12,700	0.8%	14,000	0.7%	-33.8%
Metal Mining	19,200	1.9%	10,600	0.7%	12,000	0.6%	-39.4%
Nonmetallic minerals	658	0.1%	855	0.1%	1,260	0.1%	91.8%
California							
Total	10,100,000	100.0%	13,300,000	100.0%	13,100,000	100.0%	29.9%
Total Private	8,400,000	83.1%	11,300,000	84.8%	11,100,000	84.3%	31.8%
Mining	43,300	0.4%	40,100	0.3%	28,800	0.2%	-33.5%
Metal Mining	0	N/A	2,390	0.0%	2,560	0.0%	N/A
Nonmetallic minerals	7,960	0.1%	6,730	0.1%	5,510	0.0%	-30.7%
Colorado							
Total	1,230,000	100.0%	1,500,000	100.0%	1,870,000	100.0%	52.1%
Total Private	996,000	80.9%	1,240,000	82.3%	1,580,000	84.3%	58.6%
Mining	36,000	2.9%	19,800	1.3%	13,600	0.7%	-62.2%
Metal Mining	11,700	0.9%	3,440	0.2%	2,250	0.1%	-80.7%
Nonmetallic minerals	806	0.1%	985	0.1%	1,410	0.1%	74.8%
Idaho							
Total	316,000	100.0%	386,000	100.0%	493,000	100.0%	55.7%
Total Private	250,000	78.9%	309,000	80.1%	402,000	81.5%	60.9%
Mining	4,670	1.5%	3,870	1.0%	3,070	0.6%	-34.3%
Metal Mining	3,100	1.0%	2,760	0.7%	1,850	0.4%	-40.3%
Nonmetallic minerals	1,400	0.4%	1,110	0.3%	1,200	0.2%	-14.2%
Montana							
Total	265,000	100.0%	287,000	100.0%	350,000	100.0%	32.0%
Total Private	204,000	76.8%	223,000	77.7%	280,000	80.2%	37.7%
Mining	8,850	3.3%	6,280	2.2%	5,420	1.6%	-38.8%
Metal Mining	1,920	0.7%	2,640	0.9%	2,090	0.6%	8.8%
Nonmetallic minerals	841	0.3%	826	0.3%	808	0.2%	-3.9%
Nevada							
Total	398,000	100.0%	620,000	100.0%	841,000	100.0%	111.5%
Total Private	341,000	85.7%	544,000	87.7%	742,000	88.2%	117.6%
Mining	6,220	1.6%	14,300	2.3%	14,600	1.7%	134.6%
Metal Mining	3,640	0.9%	13,000	2.1%	13,000	1.5%	257.1%
Nonmetallic minerals	1,770	0.4%	1,130	0.2%	1,470	0.2%	-16.9%
New Mexico							
Total	444,000	100.0%	561,000	100.0%	672,000	100.0%	51.4%
Total Private	335,000	75.4%	430,000	76.7%	525,000	78.2%	56.9%
Mining	29,460	6.6%	16,100	2.9%	15,400	2.3%	-47.7%
Metal Mining	10,700	2.4%	2,120	0.4%	2,160	0.3%	-79.8%
Nonmetallic minerals	3,400	0.8%	2,310	0.4%	1,970	0.3%	-42.0%

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Table G-3. Employment Trends in Study Area, 1980-1996

State	1980	Percent of 1980 Total	1990	Percent of 1990 Total	1996	Percent of 1996 Total	Percent Change 1980-1996
Oregon							
Total	1,020,000	100.0%	1,240,000	100.0%	1,470,000	100.0%	44.5%
Total Private	824,000	81.1%	1,030,000	83.3%	1,240,000	84.7%	51.0%
Mining	2,280	0.2%	1,530	0.1%	1,800	0.1%	-21.3%
Metal Mining	271	0.0%	106	0.0%	52	0.0%	-80.8%
Nonmetallic minerals	1,620	0.2%	1,300	0.1%	1,710	0.1%	5.7%
Utah							
Total	523,000	100.0%	694,000	100.0%	923,000	100.0%	76.7%
Total Private	407,000	77.8%	553,000	79.6%	767,000	83.0%	88.5%
Mining	18,500	3.5%	0	0.0%	7,930	0.9%	-57.1%
Metal Mining	8,430	1.6%	3,090	0.4%	2,840	0.3%	-66.4%
Nonmetallic minerals	999	0.2%	0	0.0%	924	0.1%	-7.5%
Washington							
Total	1,600,000	100.0%	2,140,000	100.0%	2,410,000	100.0%	50.2%
Total Private	1,290,000	80.7%	1,760,000	82.5%	1,980,000	82.3%	53.1%
Mining	3,160	0.2%	0	N/A	3,320	0.1%	5.1%
Metal Mining	869	0.1%	963	0.0%	495	0.0%	-43.0%
Nonmetallic minerals	1,580	0.1%	1,650	0.1%	2,190	0.1%	38.8%
Wyoming							
Total	205,000	100.0%	191,000	100.0%	214,000	100.0%	4.2%
Total Private	163,000	79.3%	140,000	73.4%	161,000	75.2%	-1.1%
Mining	36,000	17.6%	18,300	9.6%	15,900	7.4%	-55.9%
Metal Mining	6,430	3.1%	760	0.4%	596	0.3%	-90.7%
Nonmetallic minerals	5,690	2.8%	3,920	2.1%	3,140	1.5%	-44.9%
Study Area Total							
Total	17,000,000	100.0%	22,300,000	100.0%	24,200,000	100.0%	41.9%
Total Private	14,000,000	81.9%	18,700,000	83.6%	20,300,000	83.8%	45.3%
Mining	207,000	1.2%	138,200	0.6%	128,000	0.5%	-38.3%
Metal Mining	64,700	0.4%	40,300	0.2%	38,500	0.2%	-40.5%
Nonmetallic minerals	25,900	0.2%	20,000	0.1%	20,800	0.1%	-19.7%
U.S. Total							
Total	89,200,000	100.0%	109,000,000	100.0%	118,000,000	100.0%	32.3%
Total Private	73,400,000	82.3%	90,900,000	83.7%	99,300,000	84.2%	35.3%
Mining	10,400,002	1.2%	711,000	0.7%	578,000	0.5%	-44.4%
Metal Mining	100,000	0.1%	58,900	0.1%	53,900	0.0%	-46.1%
Nonmetallic minerals	124,000	0.1%	112,000	0.1%	107,000	0.1%	-13.6%
Study Area as Percent of U.S.							
Total	19.1%		20.6%		20.5%		
Total Private	19.0%		20.5%		20.4%		
Mining	19.9%		19.4%		22.1%		
Metal Mining	64.7%		68.5%		71.5%		
Nonmetallic minerals	20.8%		17.8%		19.4%		

Notes: Figures rounded to three significant digits. "0" shows data that were withheld to avoid disclosure of proprietary information.
N/A = not applicable.
Source: Ball 1997.

METHODOLOGY FOR ESTIMATING THE CONTRIBUTION OF LOCATABLE MINERAL PRODUCTION TO THE ECONOMIES OF THE 12 WESTERN STATES

Introduction

This analysis provides baseline estimates of the regional economic impacts of locatable mineral production in the western United States under current conditions. The estimates are based on estimated values of mine production and use of the U.S. Forest Service IMPLAN (IMpact analysis for PLANning) model. The IMPLAN model estimates the direct, indirect, and induced impacts of an economic activity on a defined region. A general overview of regional input-output (I-O) modeling is presented along with limitations of the methodology. Some results of previous regional economic analyses for energy and minerals are presented as a basis for comparison with the analysis presented here. Also presented are U.S. Department of Commerce data, which may provide some basis for potentially varying production functions and rates of return for mining operations in various states. Finally, this section of Appendix G estimates the multipliers and regional impacts from production of locatable minerals.

Estimating Regional Impacts

Regional impacts represent the effect, typically measured by the value of total output and income, of an activity on the local economy. Regional impacts can be distinguished by direct effects, indirect effects, and induced effects. Direct effects are represented by changes in the value of production in the original final demand industry. Indirect effects are backward linkages, where production is needed from industries supplying the original industry. These backward linkages can continue for several rounds and provide other economic impacts to the region. Induced effects are changes in regional household spending caused by regional employment changes. These changes in employment and income result from direct and indirect effects. The combination of direct, indirect, and induced effects result in multiplier effects from economic activities within a region.

The IMPLAN model uses the U.S. Department of Commerce national I-O model to estimate the flows of commodities used and produced by industry. The social accounts of the region under consideration are also included in the IMPLAN data base. Social accounts represent the flow of commodities to industry from producers and consumers as well as consumption of the factors of production from outside the region. Social accounts are converted to the input/output accounts and multipliers for each industry. IMPLAN includes tables that account for the percentage of each category's expenditures that remain within the region and expenditures that would flow outside the region.

Assumptions used in the I-O based regional impact models can potentially limit the accuracy of some basic models. The inputs used by every firm and the outputs produced by every firm in an industry are assumed to be used or produced in the same proportions. The assumption of homogeneous production can be a problem if production techniques greatly vary within the same industry.

The level of output for any industry is also assumed to be the only factor that determines input purchase requirements. Changes in the relative prices of inputs that would affect the mix of inputs purchased are not accounted for. Changes in technology are not accounted for unless the production functions are modified over time and the models are rerun after each change. Constant returns to scale are assumed, where production functions are linear, the effects of increased demand are additive, and the distribution of purchases and sales is assumed to be static.

I-O models represent the current relationships among production, technology, market structures, and inter-regional trade. Because these relationships are assumed to be static, substitutions between inputs are not allowed to occur. One major reason that substitution would be expected consists of changes in input prices. If the relative prices for inputs change, input substitution would be expected to occur because a different mix of inputs may become more cost effective. Changes in output prices can also cause substitution effects that would reduce total regional impacts. But substitution is not allowed to occur within the I-O model. In addition, the supply of all inputs required for current and future production is not considered to be a constraint in an I-O model.

In the short run these limitations in the I-O methodology may not create significant problems because of the relatively limited adjustments that can be made in a short time. Input substitutions may not be possible immediately, so price changes may not have a short-run impact on the types of inputs used. In the long run, however, an I-O based analysis may not reliably estimate regional impacts. The longer period of time allows producers to respond to price changes, and technology can change substantially in the long run. These factors allow for greater substitution in the long run and a greater possibility of error in a static I-O based model.

The problems of I-O based analyses may also be minor if the impact region is not large enough to significantly affect the market and, therefore, significantly affect prices of inputs and outputs. A small-market impact results in minor price effects and, therefore, minor substitution effects. If a large region is included in an analysis, price effects are more likely, and the input-output analysis will miss some substitution effects.

Estimating the regional impacts from changes in mineral production using IMPLAN may result in significant errors due to the problems mentioned above. Mining techniques for the same mineral can vary a great deal in different regions, resulting in varied input requirements. Input and output prices in the mineral industry can also fluctuate significantly over a relatively short period of time. Despite these potential problems, an analysis of mineral extraction impacts using IMPLAN reveals the magnitude of mineral production impacts.

Types of Multipliers

Output multipliers translate the impact of changes in final demand spending into changes in output. ***Total industry output*** is the value of sales, in producer prices, from industry production. Final demand reflects the value of all commodities and services purchased for final use. Final demand is equal to the sum of household purchases, government purchases, business investment purchases, exports, and inventory sales. Payments between governmental units are considered transfer payments and are excluded from this measure. Exports include purchases of goods or services that are exported out of the region.

Total income multipliers translate the impact of changes in final demand spending into changes in total income. Total income is defined as the sum of changes in employee compensation, proprietary income, and other property income, resulting from a change in final demand. Total income is equal to property income plus employee compensation. Property income includes proprietary income and other property income. Proprietary income can be defined as all income from self-employment, such as income earned by noncorporate business owners, doctors, and lawyers. Other property income includes dividends, interest, royalties, rental income, corporate profits, and corporate transfer payments. ***Employee compensation,*** a subcategory of total income, represents worker income as measured by wages, salaries, benefits, and retirement payments.

Value added multipliers translate the impact of changes in final demand spending into changes in value added. Value added represents income generated by local factors of production and payments to government, including employee compensation, proprietary income, other types of property income, and indirect business taxes. Indirect business taxes are payments to government on production, sales, purchase, or use of goods and services. Indirect business taxes do not include taxes on profit or income.

Employment multipliers are based on the fact that a change in final demand will have direct, indirect, and induced effects that will lead to employment changes. Employment multipliers measue the total change in employment from the production of $1 of output for final demand. Employment is measured by both part- and full-time jobs. Therefore, the number of jobs are not full-time equivalents.

The extent of regional impacts can be measured in IMPLAN by two types of multipliers. Type I multipliers measure the sum of the direct plus indirect effects divided by the direct effects, or: Type I multiplier = (Direct + Indirect)/(Direct). Type III multipliers account for induced effects, where: Type III multiplier = (Direct + Indirect + Induced)/(Direct). The induced effects in Type III multipliers are derived from an open model where households are exogenous or "outside" the model. The open model allows the assumption that some household spending occurs outside the region of consideration.

A large multiplier generally means that an industry is closely linked to the local economy. But if the industry is small relative to the size of the local economy, then a big multiplier does not translate into a large stimulus. A small increase in demand for a sector with a small multiplier, however, can have a significant impact if that industry produces a large proportion of total output of the regional economy. Also, if the direct effect is tiny compared to the calculated indirect and induced effects, then dividing it into indirect or the sum of indirect and induced effects will result in a large number. In these cases the large multiplier is not meaningful and should be ignored.

The Value of Mineral Production, Costs of Production, and Profits

Current information on the costs of mineral production, profits or value added from production, and the variation from region to region can provide some basis for evaluating the overall importance of locatable minerals in each region and how average production relationships apply to specific regions. The rates of return for mining operations have varied a great deal over the last 10 years. According to the U.S. Department of Commerce, Bureau of the Census, the average rate of return for all mining operations with assets of $50 million or more from the fourth quarter of 1987 to the first quarter of 1996 was 5.05 cents per dollar investment before taxes and 3.54 cents after taxes (Bureau of the Census 1997). The rate of return over the 10-year period has ranged from -7.4 cents to 14.1 cents per dollar after taxes. The rate of return for mineral extraction investment is fairly low, but this does not say that the regional impacts from mineral production are small.

Mineral production requires large amounts of investment, which supports industries providing production inputs. Tables G-4 and G-5 show the value of inputs and value added for mineral industries by state and as a national average from the 1992 Census of Mineral Industries. Although the data are not complete, they do show the relative costs of labor, supplies, and capital for different types of operations. This information is useful for modifying production relationships in the IMPLAN model.

Recent Mineral Impact Studies

A recent study of the U.S. gold industry estimated the regional impacts from gold and silver production at the state level (Dobra 1997). The Dobra study included estimates of the total value of gold and silver production as well as employment, output, and earnings impacts in 1995. The results are presented in Table G-6.

The Dobra study used production estimates provided by individual state geology agencies or the U.S. Geological Survey, London gold and silver prices, and U.S. Bureau of Economic Analysis impact multipliers. The important result of the study is the large regional impacts associated with gold production in the western states.

Another study of regional impadcts of resttraints to mineral access in the East Mojave National Scenic Area estimated the potential impacts to industry output, earnings, and employment in San Bernardino County, California, from mine construction and production (Schantz and Adams 1990). The East Mojave study showed impacts of about $1.27 billion from cumulative gold mine revenues of $968 million at the county level. These amounts represent substantial impacts considering the small study area.

Another study, published by the National Mining Association (see Table G-7) estimated the economic impact of the solid-minerals mining industry (Leaming 1997). This study, which included minerals such as coal and many nonlocatable types, estimated that the western states generated $115 billion and 1.1 million jobs in 1995. These figures amount to 37% of the $524

Table G-4. Employment, Payroll, Value Added, and Costs of Production for Mining (million $)

State/type of mining	Establishments	Total Employees	Payroll	Value added by mining	Cost of supplies	Capital expenditures
Alaska						
Lead and zinc ores	2	250-499	-	-	-	-
Gold	41	400	$19.0	$129.4	-	-
Arizona						
Copper ores	28	10,100	384.6	1,429.9	$888.9	$187.2
Gold ores	28	300	11.3	48.1	-	-
Silver ores	1	<199	-	-	-	-
Metal mining services	27	500	15.1	42.2	17.9	5.0
California						
Gold ore	45	2,100	77.3	267.7	-	-
Miscellaneous metal ores	11	250-499	-	-	-	-
Colorado						
Lead and zinc ores	5	-	-	-	-	-
Gold ores	52	1,200	88.7	4.8	-	-
Silver ores	1	-	-	-	-	-
Metal mining services	20	200	7.0	12.2	4.3	1.2
Idaho						
Lead and zinc ores	5	100-249	-	-	-	-
Gold ores	25	250-499	-	-	-	-
Silver ores	9	250-499	-	-	-	-
Miscellaneous metal ores	4	250-499	-	-	-	-
Montana						
Copper ores	3	500-999	-	-	-	-
Gold & silver ores	21	1000	36.8	160.6	60.9	31.6
Metal mining services	16	200	6.3	15.0	-	-
Miscellaneous metal ores	7	250-499	-	-	-	-
Nevada						
Gold and silver ores	119	9,900	455.1	1,718.0	1,096.2	556.1
Metal mining services	36	1,100	40.6	106.4	-	-
New Mexico						
Copper ores	7	1000-2499	-	-	-	-
Utah						
Copper ores	5	1000-2499	-	-	-	-
Gold and silver ores	23	500	20.2	79.3		-
Metal mining services	22	400	16.4	14.2	-	-
Miscellaneous metal ores	11	100-249	-	-	-	-
Washington						
Gold and silver ores	13	500	23.5	67.2	-	-
Metal mining services	14	100	4.9	8.8	-	-
Wyoming						
Miscellaneous metal ores	15	300	$15.3	$14.5	-	-

Source: Bureau of the Census 1996a and 1996b.

Table G-5. National Average Costs of Production for Various Minerals, 1992 (million $)

Item	Copper	Gold	Metal Mining Services	Miscellaneous Metal Ores	Silver
Supplemental labor costs	$136.7	$181.2	$29.9	$24.7	$16.7
Purchased fuels consumed	61.4	108.9	16.2	8.8	4.5
Purchased electricity	316.7	143.9	2.2	29.5	4.5
Contract work	113.7	-	-	-	-
Minerals/ores for preparation	208.3	NA	NA	1.6	NA
Purchased machinery	370.5	362.1	13.1	9.5	-
Parts and attachments	146.9	147.1	8.7	13.0	-
Industrial chemicals	104.1	128.3	NA	13.6	-
Explosive materials	37.4	61.6	-	3.2	-
Tires and inner tubes	39.9	39.0	-	0.8	-
Lime	21.8	26.3	-	1.2	-
Iron & steel castings and forgings	79.5	37.1	-	-	-
Steel shapes and forms	43.5	34.9	-	3.7	-
Other supplies	175.5	196.1	23.8	19.6	-
Undistributed	2.5	21.2	23.0	9.8	-
Communication services	1.7	3.3	0.8	0.4	0.1
Value of shipments and receipts	3,374.9	4,340.0	350.4	312.2	114.6
Change in inventories 1991-1992	21.6	18.4	3.2	-14.7	-10.9
New capital expend, buildings	-	538.2	0.4	5.0	-
New capital expend, equipment	385.8	103.8	16.5	14.4	-
Used capital expenditures	8.6	16.4	-	-	0.1
Mineral exploration/development	-	335.3	NA	-	5.0
Rental payments	$18.4	23.6	$6.9	$2.0	-
Lease rents	-	$10.1	NA	-	$0.1

Source: Bureau of the Census 1996c and 1996d.

billion total U.S. impact of solid-mineral mining and 22% of the estimated 5 million total jobs. The data and methodology used in this study differ substantially from the multiplier analyses described previously, and the figures cannot be compared between the studies. This study, nevertheless, provides a useful comparison of the western mining industry in relation to the national industry as a whole.

A U.S. Forest Service analysis of energy and minerals industries in the United States provided information on the economic contribution of U.S. extractive industries at the state, regional, and national levels (USFS 1996). This study estimated multipliers for metallic ores, including copper, gold, silver, ferroalloy ores, uranium, radium, and other metal ores not classified elsewhere. The study also estimated multipliers for metal mining services, describing in detail mineral industry impacts. This study can be used to help validate the regional economic impacts presented in this analysis. The Forest Service analysis estimated multipliers for 1977, 1982, 1985, and 1990 for the Nation, for each Resource Planning Act region in the United States, and for individual states. State-level multipliers are presented for 1985 and 1990 in Tables G-8 and G-9.

Table G-6. Impacts of U.S. Gold and Silver Production, 1995 ($000)

State	Total value	Employment (jobs)	Output	Earnings
Alaska	$54,474	757	$96,500	$27,798
Arizona	63,209	2,010	154,977	51,389
California	302,828	5,602	621,039	170,977
Idaho	64,091	1,416	116,421	34,000
Montana	180,676	4,553	365,272	105,587
Nevada	2,708,263	51,457	4,832,354	1,485,211
Utah	$303,070	12,093	$661,330	$239,001

Source: Dobra 1997.

The Forest Service analysis also presented base year statistics that estimate the regional impacts from extraction industries. These results showed significant impacts from mineral and energy industry activities. But the importance of metal mining in the United States appeared to have decreased slightly from 1977 to 1990. The decrease in the importance of metal mining was not universal. Metal mining increased in importance in Nevada from 0.52% of nominal gross state product in 1977 to 6.12% of nominal gross state product in 1990.

Table G-7. Economic Impact of Solid-Mineral Mining from NMA Study ($000)

State	Total Value of Solid Minerals Produced	Total Economic Impact	Total Employment
Alaska	$589,600	$1,342,600	12,000
Arizona	4,975,800	13,715,900	137,300
California	2,866,100	52,475,900	469,200
Colorado	995,500	7,634,600	77,300
Idaho	383,300	1,898,300	23,600
Montana	1,049,400	2,214,100	24,900
Nevada	3,291,300	7,067,000	63,000
New Mexico	1,775,300	3,409,000	44,000
Oregon	391,600	5,108,300	53,500
Utah	2,417,000	6,907,000	66,200
Washington	730,300	9,604,800	92,300
Wyoming	2,695,500	3,967,400	41,400
12-State Total	22,160,700	115,344,900	1,104,700
U.S. Total	$60,055,000	$523,604,100	4,954,000
Western Region as Percent of U.S.	37%	22%	22%

Source: Leaming 1997.

Multipliers and Regional Impacts from Locatable Mineral Production

The IMPLAN model was used along with estimates of the value of locatable mineral production at the state level to estimate regional impacts. The categories of minerals include gold, silver, copper, and other metals and industrials. The regional impacts for the "other metals and industrials" category were estimated using the metal mining services and other metals sectors. The types of mining operations in the West greatly vary, and the input requirements can vary a great deal. This variation will affect the estimated multipliers. The multipliers estimated using the IMPLAN model are based on national-level production relationships. The multipliers and regional impact analysis can be improved by adjusting the input requirements for different types of operations.

The production function coefficients can be modified in IMPLAN to account for regional production differences. These modifications require detailed input requirement data from which production relationships can be estimated. Detailed input requirement data are not available from a cross-section of mining operations at a small regional level. But Bureau of the Census data, such as in Tables G-4 and G-5, can be used to estimate the percentage of total production costs attributable to labor and capital expenditures. These percentages, on a statewide basis, can be compared to the national average and used to modify the labor and capital percentages represented in the IMPLAN model.

The U.S. Department of Commerce mining cost data for employee payroll and capital expenditures for each of the 12 states and the study area total were compared to the national average. These percentages were then applied to the national average employee compensation and capital equipment categories included in the IMPLAN model. The new coefficients were then applied to the individual states. In most cases the differences were less than a 10% change in the coefficient, but the change was important enough to merit the modification.

Although this method for modifying the production functions is not precise, it does attempt to account for regional differences in mineral production. Any evaluation of surface mining regulation alternatives will use a consistent methodology so the economic impacts of the alternatives can be compared on an equal basis. The multipliers for locatable minerals in the study area are presented by state and type of mineral in Table G-10.

The regional impacts from locatable mineral production are based on the estimated value of production adjusted for the local level of activity using IMPLAN local purchase coefficients (LPCs). These LPCs show the percentage of regional demand that can be met by local sources and represent the proportion of activity that occurs in the model region. Using the LPCs better represents the true impact of the mining on the region because the need for some imports is recognized. Assuming all regional demand can be met locally would overstate the regional economic impacts.

The mineral production values used to estimate the regional impacts are presented in Table G-11. These figures represent the portion of mine production of locatable minerals estimated to originate only from public lands in the study area.

Table G-8. 1985 Multipliers Derived in the Forest Service Analysis

State or Region	Output Type I	Output Type III	Total Income Type I	Total Income Type III	Value Added Type I	Value Added Type III	Employment Type I	Employment Type III
Alaska								
Metallic ores	1.28	1.44	1.64	2.06	1.44	1.71	1.27	1.52
Metal mining services	1.23	1.46	1.41	1.87	1.32	1.65	1.14	1.35
Arizona								
Metallic ores	1.40	1.68	1.69	2.27	1.62	2.13	1.40	1.79
Metal mining services	1.28	1.49	1.53	1.99	1.29	1.54	1.39	1.78
Idaho								
Metallic ores	1.24	1.61	1.34	1.89	1.32	1.85	1.26	1.82
Metal mining services	1.22	1.63	1.30	1.88	1.27	1.82	1.21	1.74
Montana								
Metallic ores	1.45	2.10	2.09	3.95	1.66	2.72	1.47	2.50
Metal mining services	1.34	1.93	1.61	2.75	1.40	2.12	1.38	2.36
New Mexico								
Metallic ores	1.43	1.86	1.65	2.38	1.56	2.19	1.45	2.16
Metal mining services	1.39	2.02	1.83	3.24	1.50	2.36	1.27	1.89
Nevada								
Metallic ores	1.47	2.01	1.77	2.77	1.76	2.74	1.49	2.24
Metal mining services	1.36	1.89	1.43	2.11	1.44	2.12	1.36	2.05
Utah								
Metallic ores	1.46	1.81	1.75	2.41	1.65	2.21	1.48	2.06
Metal mining services	1.31	1.61	1.47	1.94	1.33	1.65	1.41	1.96
Wyoming								
Metallic ores	1.28	1.56	1.52	2.07	1.36	1.74	1.25	1.68
Metal mining services	1.24	1.47	1.39	1.76	1.27	1.53	1.27	1.71
Pacific Region (California, Oregon, and Washington)								
Metallic ores	1.58	2.31	2.08	4.32	1.99	4.05	1.39	2.34

Source: USFS 1996.

The estimated regional impacts from the production of locatable minerals on public lands in the study area are presented in Table G-12. The impacts presented here are based on average production relationships at the national level. Therefore, the estimates are representative of the magnitude of the impacts rather than precise estimates.

The study-area total listed in Table G-12 is not a summation of the impacts estimated for each state. The study area represents a separate IMPLAN impact area. The expenditure and income leakages from the aggregate 12-state area would not be the same as the sum of leakages for each state. Since the larger area would be expected to have relatively small leakages, the overall economic impact of mineral production from a 12-state perspective would be expected to be larger than shown by the individual states.

In comparison, Table G-13 shows the regional economic impacts of all locatable-type mineral production in the study area regardless of land ownership (i.e. including production originating from federal, state, and private lands).

Tables G-14 through G-16 show the regional economic impacts by alternative for Alternatives 2, 3, and 4. See the Economics section in Chapter 3 for an explanation of these impacts.

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Table G-9. 1990 Multipliers Derived in the Forest Service Analysis

State or Region	Output Type I	Output Type III	Total Income Type I	Total Income Type III	Value Added Type I	Value Added Type III	Employment Type I	Employment Type III
Alaska								
Metallic ores	1.16	1.22	1.22	1.31	1.19	1.26	1.39	1.70
Metal mining services	1.14	1.25	1.18	1.35	1.14	1.27	1.15	1.40
Arizona								
Metallic ores	1.54	1.76	2.43	3.24	2.48	3.36	2.50	3.85
Metal mining services	1.27	1.67	1.29	1.77	1.28	1.75	1.30	2.02
Idaho								
Metallic ores	1.33	1.56	1.47	1.80	1.46	1.78	1.92	3.00
Metal mining services	1.27	1.64	1.31	1.74	1.29	1.70	1.37	2.17
Montana								
Metallic ores	1.40	1.67	1.61	2.08	1.55	1.96	2.00	3.31
Metal mining services	1.26	1.63	1.30	1.77	1.25	1.63	1.37	2.28
New Mexico								
Metallic ores	1.56	1.79	2.35	3.06	2.29	2.99	2.56	4.07
Metal mining services	1.33	1.77	1.38	1.94	1.34	1.86	1.34	2.15
Nevada								
Metallic ores	1.37	1.62	1.49	1.82	1.50	1.85	1.82	2.69
Metal mining services	1.32	1.70	1.36	1.81	1.36	1.82	1.34	1.99
Utah								
Metallic ores	1.55	1.77	2.18	2.78	2.15	2.74	2.52	3.84
Metal mining services	1.30	1.66	1.32	1.73	1.30	1.67	1.36	2.10
Wyoming								
Metallic ores	1.19	1.37	1.19	1.40	1.18	1.36	1.25	1.72
Metal mining services	1.20	1.38	1.20	1.41	1.18	1.37	1.24	1.71
Pacific Region (California, Oregon, and Washington) Metallic ores	1.45	1.88	1.57	2.14	1.59	2.19	1.97	3.43

Source: USFS 1996.

Table G-10. Estimated 1994 Multipliers

State or Region	Output		Total Income		Value Added		Employment	
	Type I	Type III	Type I	Type III	Type I	Type III	Type I	Type III
Alaska								
Gold	1.32	1.45	1.40	1.60	1.35	1.53	1.63	2.13
Silver	1.10	1.37	1.09	1.35	1.07	1.28	1.08	1.43
Other	1.12	1.25	1.13	1.30	1.12	1.26	1.19	1.56
Arizona								
Gold	1.34	1.62	1.39	1.77	1.37	1.71	1.68	2.64
Silver	1.00	1.57	1.00	1.42	1.00	1.36	1.00	1.59
Copper	1.29	1.56	1.31	1.63	1.30	1.60	1.62	2.55
Other	1.19	1.66	1.23	1.89	1.21	1.79	1.16	1.85
California								
Gold	1.37	1.70	1.36	1.71	1.36	1.73	1.58	2.51
Silver	1.10	1.86	1.07	1.63	1.07	1.61	1.05	1.69
Copper	1.30	1.68	1.27	1.64	1.28	1.66	1.39	2.21
Other	1.10	1.37	1.08	1.29	1.08	1.30	1.17	1.86
Colorado								
Gold	1.43	1.67	1.46	1.74	1.43	1.68	2.14	3.41
Silver	1.12	1.76	1.09	1.62	1.08	1.52	1.07	1.74
Copper	1.36	1.60	1.36	1.60	1.34	1.57	1.96	3.13
Other	1.15	1.37	1.13	1.34	1.12	1.31	1.31	2.09
Idaho								
Gold	1.29	1.50	1.27	1.47	1.26	1.47	1.63	2.54
Silver	1.21	1.62	1.20	1.64	1.17	1.55	1.23	1.95
Copper	1.20	1.40	1.17	1.34	1.17	1.35	1.50	2.34
Other	1.17	1.57	1.14	1.49	1.13	1.46	1.19	1.88
Montana								
Gold	1.37	1.57	1.37	1.61	1.33	1.54	1.83	2.93
Silver	1.11	1.25	1.09	1.23	1.07	1.16	1.27	2.03
Copper	1.31	1.53	1.28	1.51	1.27	1.48	1.61	2.58
Other	1.11	1.29	1.08	1.26	1.07	1.22	1.22	1.94
Nevada								
Gold	1.41	1.60	1.48	1.73	1.47	1.74	1.75	2.42
Silver	1.04	1.39	1.03	1.26	1.03	1.26	1.03	1.45
Copper	1.37	1.63	1.43	1.76	1.44	1.79	1.48	2.08
Other	1.01	1.28	1.01	1.17	1.01	1.18	1.01	1.42
New Mexico								
Gold	1.52	1.71	1.77	2.15	1.58	1.84	2.98	4.65
Silver	1.24	1.46	1.29	1.62	1.18	1.38	1.49	2.33
Copper	1.50	1.79	1.78	2.31	1.65	2.09	1.94	3.02
Other	1.24	1.62	1.36	2.03	1.27	1.78	1.25	1.98
Oregon								
Gold	1.11	1.37	1.08	1.28	1.08	1.27	1.20	1.98
Copper	1.07	1.30	1.05	1.20	1.05	1.20	1.14	1.89
Other	1.20	1.71	1.26	1.96	1.22	1.82	1.19	1.99
Utah								
Gold	1.40	1.64	1.53	1.90	1.46	1.77	2.04	3.17
Silver	1.15	1.44	1.12	1.40	1.09	1.31	1.19	1.85
Copper	1.38	1.63	1.46	1.82	1.42	1.75	1.83	2.85
Other	1.20	1.45	1.22	1.53	1.19	1.46	1.34	2.08
Washington								
Gold	1.24	1.47	1.20	1.39	1.20	1.40	1.51	2.43
Silver	1.09	1.55	1.06	1.41	1.06	1.37	1.08	1.77
Copper	1.20	1.48	1.15	1.36	1.15	1.38	1.32	2.13
Other	1.05	1.50	1.03	1.32	1.03	1.32	1.04	1.71
Wyoming								
Other	1.18	1.32	1.25	1.46	1.20	1.36	1.49	2.15
12 State Total								
Gold	1.59	1.97	1.70	2.22	1.68	2.19	2.11	3.44
Silver	1.11	1.67	1.07	1.49	1.07	1.45	1.08	1.80
Copper	1.49	1.87	1.58	2.09	1.53	2.00	1.84	3.00
Other	1.19	1.50	1.19	1.54	1.17	1.47	1.32	2.15

Source: USFS 1996.

Table G-11. Value of Locatable Mineral Production Originating from Public Lands - 1996 ($000)

Portion of study-area production originating from public lands[1]	43.4%	36.2%	1.0%	2.4%	N/A
State	**Gold**	**Silver**	**Copper**	**Other Metals & Industrials**	**Total**
Alaska	$26,500	$7,890	$0	$11,500	$45,800
Arizona	9,500	11,400	29,800	7,300	58,000
California	130,000	1,310	0	23,000	154,000
Colorado	26,000	453	0	6,020	32,500
Idaho	40,300	13,900	0	5,830	60,000
Montana	49,500	5,680	940	5,350	61,500
Nevada	1,160,000	36,600	580	5,590	1,210,000
New Mexico	2,170	1,210	6,150	1,830	11,400
Oregon	0	0	0	1,830	1,830
Utah	126,000	10,000	7,080	12,700	156,000
Washington	21,100	0	0	3,910	25,000
Wyoming	0	0	0	4,850	4,850
Study-Area Total	1,590,000	88,400	44,550	89,700	1,820,000
U.S. Total (all land types)	$3,980,000	$263,000	$4,610,000	$8,800,000	$17,700,000
Public Land Portion as Percent of U.S. Total	40%	34%	1%	1%	10%

[1] Source: USDI 1993.

N/A = not applicable. Figures rounded to three significant digits. Some totals may reflect rounding errors.

Table G-12. Estimated Regional Impacts from Production of Locatable Minerals on Public Lands 1996 ($000)

State	Total industry Output	Personal Income		Value added	Employment (jobs)
		Total	Employee Compensation		
Alaska	$52,800	$42,800	$11,400	$31,400	370
Arizona	53,700	26,700	15,900	31,200	410
California	233,900	124,500	75,700	136,200	1,650
Colorado	47,000	23,200	13,200	27,500	280
Idaho	79,800	41,100	24,500	47,300	675
Montana	86,200	40,200	25,100	51,700	570
Nevada	1,866,900	854,800	479,900	935,300	11,060
New Mexico	13,200	4,900	2,300	6,600	100
Oregon	1,100	800	500	900	10
Utah	108,100	43,700	23,100	54,000	760
Washington	27,900	16,500	10,700	18,600	170
Wyoming	3,300	1,700	800	2,300	30
12-State Area	$3,339,300	$1,495,300	$819,200	$1,706,300	22,860

Note: These estimates include **only** production estimated to originate from federal lands

Source: IMPLAN Input-Output Modeling System

Table G-13. Estimated Regional Impacts from Production of Locatable Minerals 1996 — All Land Ownerships ($000)

State	Total industry Output	Personal Income		Value added	Employment (jobs)
		Total	Employee Compensation		
Alaska	$420,800	$251,900	$118,400	$316,400	4,100
Arizona	4,740,300	2,331,800	1,381,600	2,705,400	35,200
California	1,152,100	735,400	433,100	809,500	11,150
Colorado	266,400	164,400	97,100	196,000	2,100
Idaho	364,000	195,500	103,100	228,300	3,800
Montana	470,700	248,000	149,600	316,100	3,650
Nevada	4,474,900	2,105,400	1,191,500	2,302,400	27,150
New Mexico	837,000	31,200	147,700	400,900	6,450
Oregon	48,100	35,000	20,200	39,100	350
Utah	1,690,600	765,600	403,800	924,600	13,350
Washington	149,700	99,200	60,400	113,100	1,350
Wyoming	136,000	69,800	34,000	95,400	1,250
Study Area	$18,301,200	$8,857,600	$4,928,800	$10,249,100	135,650

Table G-14. Alternative 2 (State Management)
Estimated Total Regional Economic Impacts from Production of Locatable Minerals on Federal Lands ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Jobs
			Total	Employee Compensation		
Alaska	$48,100	$55,400	$26,000	$12,000	$33,000	400
Arizona	60,900	56,400	28,000	16,700	33,000	450
California	162,000	246,000	131,000	79,500	143,000	1,750
Colorado	34,100	49,400	24,400	13,900	28,900	300
Idaho	63,000	83,800	43,200	25,700	49,700	700
Montana	64,500	90,500	42,200	26,400	54,300	600
Nevada	1,270,000	1,960,000	898,000	504,000	982,000	11,600
New Mexico	11,900	13,900	5,150	2,420	6,930	100
Oregon	1,920	1,160	840	525	945	<25
Utah	163,000	114,000	45,900	24,300	56,700	800
Washington	26,300	29,300	17,300	11,200	19,500	200
Wyoming	5,090	3,470	1,7[illegible]	840	2,420	50
Study-Area Total	$1,910,000	$3,510,000	$1,570,[illegible]	$860,000	$1,790,000	24,000

Estimated Change in Regional Economic Acti[illegible]ent Conditions ($000)

State	Value of Production	Total Industry Output	Per[illegible]		Value Added	Jobs
			Total	[illegible]ion		
Alaska	$2,300	$2,640	$1,240	$570	$1,570	<25
Arizona	2,900	2,690	1,340	795	1,560	<25
California	7,710	11,700	6,230	3,790	6,810	100
Colorado	1,630	2,350	1,160	660	1,380	<25
Idaho	3,000	3,990	2,060	1,230	2,370	50
Montana	3,070	4,310	2,010	1,260	2,590	50
Nevada	60,300	93,300	42,700	24,000	46,800	550
New Mexico	568	660	245	115	330	<25
Oregon	91	55	40	25	45	<25
Utah	7,780	5,410	2,190	1,160	2,700	50
Washington	1,250	1,400	825	535	930	<25
Wyoming	242	165	85	40	115	<25
Study Area Total	$90,800	$166,000	$74,800	$41,000	$85,300	1,150

Notes: Figures rounded to three significant digits. Employment figures rounded to nearest 50, except figures under 25.

Table G-15. Alternative 3 (Proposed Action)
Estimated Total Regional Economic Impacts from Production of Locatable Minerals on Federal Lands ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Jobs
			Total	Employee Compensation		
Alaska	$43,500	50,200	$23,600	$10,800	$29,800	350
Arizona	55,100	51,000	25,400	15,100	29,600	400
California	146,000	222,000	118,000	71,900	129,000	1,550
Colorado	30,900	44,700	22,000	12,500	26,100	250
Idaho	57,000	75,800	39,000	23,300	44,900	650
Montana	58,400	81,900	38,200	23,800	49,100	550
Nevada	1,150,000	1,770,000	812,000	456,000	889,000	10,500
New Mexico	10,800	12,500	4,660	2,190	6,270	100
Oregon	1,740	1,050	760	475	855	<25
Utah	148,000	103,000	41,500	21,900	51,300	700
Washington	23,800	26,500	15,700	10,200	17,700	150
Wyoming	4,610	3,140	1,620	760	2,190	50
Study Area Total	$1,730,000	$3,170,000	$1,420,000	$778,000	$1,620,000	21,700

Estimated Change in Regional Economic Activity from Current Conditions ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Jobs
			Total	Employee Compensation		
Alaska	($2,290)	($2,640)	($1,240)	($570)	($1,570)	(<25)
Arizona	(2,900)	(2,690)	(1,340)	(795)	(1,560)	(<25)
California	(7,710)	(11,700)	(6,230)	(3,790)	(6,810)	(100)
Colorado	(1,630)	(2,350)	(1,160)	(660)	(1,380)	(<25)
Idaho	(3,000)	(3,990)	(2,060)	(1,230)	(2,370)	(50)
Montana	(3,070)	(4,310)	(2,010)	(1,260)	(2,590)	(50)
Nevada	(60,300)	(93,300)	(42,700)	(24,000)	(46,800)	(550)
New Mexico	(568)	(660)	(245)	(115)	(330)	(<25)
Oregon	(91)	(55)	(40)	(25)	(45)	(<25)
Utah	(7,780)	(5,410)	(2,190)	(1,160)	(2,700)	(50)
Washington	(1,250)	(1,400)	(825)	(535)	(930)	(<25)
Wyoming	(242)	(165)	(85)	(40)	(115)	(<25)
Study Area Total	($90,800)	($167,000)	($74,800)	($41,000)	($85,300)	(1,150)

Notes: Figures rounded to three significant digits. Employment figures rounded to nearest 50, except figures under 25.

Table G-16. Alternative 4 (Maximum Protection)

Estimated Total Regional Economic Impacts from Production of Locatable Minerals on Public Lands ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Jobs
			Total	Employee Compensation		
Alaska	$39,000	$44,900	$21,100	$9,690	$26,700	300
Arizona	40,600	37,600	18,700	11,100	21,800	300
California	116,000	175,000	93,400	56,800	102,000	1,250
Colorado	22,800	32,900	16,200	9,240	19,300	200
Idaho	48,000	63,800	32,900	19,600	37,800	550
Montana	43,000	60,300	28,100	17,600	36,200	400
Nevada	844,000	1,310,000	598,000	336,000	655,000	7,750
New Mexico	7,950	9,240	3,430	1,610	4,620	50
Oregon	1,740	1,050	760	475	855	<25
Utah	109,000	75,700	30,600	16,200	37,800	550
Washington	20,000	22,300	13,200	8,560	14,900	150
Wyoming	4,610	3,140	1,360	640	1,840	<25
Study Area Total	$1,300,000	$2,340,000	$1,050,000	$573,000	$1,190,000	16,000

Estimated Change in Regional Economic Activity from Current Conditions ($000)

State	Value of Production	Total Industry Output	Personal Income		Value Added	Jobs
			Total	Employee Compensation		
Alaska	($6,880)	($7,920)	($3,720)	($1,710)	($4,710)	(50)
Arizona	(17,400)	(16,100)	(8,010)	(4,770)	(9,360)	(100)
California	(38,500)	(58,500)	(31,100)	(18,900)	(34,100)	(400)
Colorado	(9,760)	(14,100)	(6,960)	(3,960)	(8,250)	(100)
Idaho	(12,000)	(16,000)	(8,220)	(4,900)	(9,460)	(150)
Montana	(18,400)	(25,900)	(12,100)	(7,530)	(15,500)	(150)
Nevada	(362,000)	(560,000)	(256,000)	(144,000)	(281,000)	(3,300)
New Mexico	(3,410)	(3,960)	(1,470)	(690)	(1,980)	(50)
Oregon	(91)	(55)	(40)	(25)	(45)	(<25)
Utah	(46,700)	(32,400)	(13,100)	(6,930)	(16,200)	(250)
Washington	(5,000)	(5,580)	(3,300)	(2,140)	(3,720)	(50)
Wyoming	(242)	(165)	(340)	(160)	(460)	(<25)
Study Area Total	($520,000)	($1,000,000)	($449,000)	($246,000)	($512,000)	(6,850)

Notes: Figures rounded to three significant digits. Employment figures rounded to nearest 50, except figures under 25.

APPENDIX H
RECIPIENTS OF THE DRAFT EIS

AGENCIES AND ORGANIZATIONS

3 R Minerals
3 R Associate Environmental Consultants
Absentee Shawnee Tribe of Oklahoma
ADEQ
AEG
AES Engineering
Afognak Native Corporation
AGRA Earth & Environment
Agua Caliente Band of Cahuilla Indians
Ahtna, Inc.
Ak-Chin Indian Community
Akhiok-Kaguyak,inc.
Akiachak, Limited
Akutan Corporation
Alabama and Coushatta Tribes
Alabama Quassarte Tribal Town
Alakanuk Native Corporation
Alamo Navajo Chapter
Alaska Miners Association, Inc.
Alaska Peninsula Corporation
Alaska State Governor's Office
Alaska Placer Development, Inc.
Aleknagik Natives Ltd.
Aleut Corporation
Alta Gold
Alturas Rancheria Federal Reservation
Amax Gold Inc. - Sleeper Mine
American Assay Labs, Inc.
American Canoe Association
American Colloid Company
American Whitewater
American Land Conservancy
American Fisheries Society, OR Chapter
American Resource Corporation, Inc.
Amigos
Andalex
Apache Tribe of Oklahoma
Apex Bulk Commodities
Applied Independent Technology
Applied Ecosystem Services, Inc.
Arapaho Tribe
Arco Alaska, Inc.
Arctic Slope Consulting Group
Arctic Village
Arctic Treks
Arizona Builders Alliance
Arizona Department of Commerce
Arizona Audubon Council
Arizona Mining Association
Arizona Department of Mines/Mineral Resources
Arizona State Governor's Office
Arizona State Historic Preservation Off.
Arizona Electric Power Cooperative, Inc.
Arizona Game & Fish Department
Arizona State Parks
Arctic Slope Regional Corporation

Arviq, Inc.
ASARCO Inc.
ASE Management - BHP Minerals, Int.
Askinuk Corporation
Aspen Exploration
Atmautluak, LimitedAsqanuk Corp.
Atxam Corporation
AUR Resources (USA) Inc.
Austin Powder Company
Avalon Development Corporation
Azachorok, Inc.
Baan-O-Yeel Kon Corporation
Bagdad Unified School District, AZ
Bagdad Fire Department, AZ
Bald Mountain Mine
Ballard Spahr Andrews & Ingersoll
Bamberg Associates
Barona Group of the Barona Reservation
Barretts Minerals, Inc.
Barrick Bullfrog Mine
Barrick Gold Corporation
Battle Mountain Band Colony
Battle Mountain Gold
Bay View Inc.
Bean Ridge Corporation
Bear River Band of Rohnerville
Rancheria
Bear Creek Council
Beartooth Alliance
Beaver Kwit'Chin Corporation
Becharof Corporation
Behre Dolbear
Belkofski Corporation
Bells Flats Natives, Inc.
Benton County Commission, OR
Bentonite Corporation
Bering Straits Native Corporation
Berry Creek Rancheria of Maidu Indians
Bethel Native Corporation
Beveridge & Diamond
BHP Copper
BHP - DC Office
BHP Nevada Mining Company
BHP Copper Robinson
BHP Minerals
Big Valley Rancheria
Big Pine Band of Owens Valley
Paiute-Shoshone Indians
Big Lagoon Rancheria
Big Sandy Rancheria Of Mono Indians
Bjork, Lindley & Danielson, P.C.
Blackfeet Reservation
Blue Lake Business Council
BMOA/OIM
Boart Longyear Company
Breckenridge Minerals
Brevig Mission Native Corporation

Bridgeport Paiute Indian Colony
Bristol Bay Native Corporation
Brohm Mining Corporation
Brush Wellman, Inc.
Bureau of Land Management Resource Advisory Councils
Bureau of Land Management
Burns Paiute Tribe
Butte District Resource Advisory Council
C.W. Rech & Company, Inc.
Cabazon Band of Mission Indians
Cable Mountain Mine
Cachil Dehe Band of Wintun Indian of the Colusa Ind.
Caddo Tribe of Oklahoma
Cahto Indian Tribe
Cahuilla Band of Indians
California Department of Fish & Game
California Wilderness Coalition
California Coastal Commission
California Department of Transportation, District 3
California Senate Committee on Environmental Quality
California Department of Fish and Game, Region 5
California State Governor's Office
California Native American Tribes
California Mining Association
California Trade and Commerce Agency, Office of Permit Assistance
Calista Corporation
Campo Band of Mission Indians
Camtec Industrial Sales
Canoncito Navajo Colony
Canyon Resources Corporation
Cape Fox Corporation
Carlotta Copper Company
Carson Colony Community Council
Casper Star-Tribune
Cedarville Rancheria of Northern Paiute Indians
Celilo Village Portland Office
Center for Alternative Mining Development Policy
Center for Science in Public Participation
Chalkyitsik Native Corporation
Chaluka Corporation
Chefarnrmute, Inc.
Chehalis Business Council
Chehalis, Chinook, and Quinault
Chemehuevi Indian Tribe
Chemical Lime Company
Chenega Corporation
Cherokee Nation Economic & Business Development
Chevak Company Corporation

Cheyenne-Arapaho Tribes
Cheyenne River Sioux Tribe
Chickaloon-Moose Native Assoc., Inc.
Chignik River Limited
Chignik Lagoon Native Corporation
Chilkoot Indian Association
Chinuruk Inc.
Chippewa-Cree Tribe
Chitina Native Corporation
Choctaw Nation of Oklahoma
Choggiung Ltd
Chugach Natives Inc.
Chugach Alaska Corporation
Churchill County Commission, NV
Citizen Band of Potawatomi
Citizen's Coal Council
Citizens for the West
City of Globe, AZ
City of Safford, AZ
CLC
Clean Sites
Clean Age Minerals
Climax Moly Company
Coast Indian Community
Coastal Chemicals, Inc.
Cochise Co., AZ
Cocopah Indian Tribe
Coeur D'Alene Tribal Council
Coeur D'Alene Mines Corporation
Coeur Rochester, Inc.
Cold Springs Rancheria of Mono Indians
Colorado Mining Association
Colorado State Governor's Office
Colorado Indian Tribe
Colville Reservation
Comanche Tribe of Oklahoma
Cominco American
Condor Earth Technologies, Inc.
Confederated Salish and Kootenai Tribes
Confederated Tribe of Coos, Lower
  Umpqua and Siuslaw Indians
Confederated Tribes of the Umatilla
Consumers Health Freedom Coalition
Continental Minerals, Inc.
Continental Lime, Inc.
Control Industries, Inc.
Cook Inlet Region, Inc.
Coquille Indian Tribe Community
Cordex Exploration Company
Corporon Hothe Svitavsky Eyler & Hill
Cortez Gold Mines
Cortina Indian Rancheria of Wintun
  Indians
Cotter Corporation
Council Native Corporation
County of San Bernardino, CA
Covelo Indian Community
Cow Creek Band of Umpqua Tribe of
  Indians
Coyote Valley Tribal Council
CR Minerals
CR Kendall
CRC, Company
Creek Nation of Oklahoma, Office of the
  Principal Chief
Crosible Filtration, Inc.
Crow Creek Sioux Reservation
Crow Tribe
Crowell & Moring
Crown Resources
Crusher Service Company
CSM
Cully Corporation
CURE
Cuyapaipe Band of Mission Indians
CWG
Cyprus Amax Minerals
Cyprus Bagdad Copper Corporation
Cyprus Sierrita Corporation
Cyprus Miami Mining
D.H. Blattner & Sons
D&D Tire, Inc.
Dakota Resource Council
Danzhit Hanlaii Corporation
Davis, Graham & Stubbs
Death Valley Timbi-Sha Shoshone Band
Dee Gold Mining Company
Defenders of Wildlife
Delaware Tribe of Western Oklahoma
Deloycheet, Inc.
Desert Survivors
Devils Lake Sioux Tribe A.K.A. Mni
  Wakan Oyate Tribe
Dickenson City Citizens Committee
"Save Virginia's Baby"
Digmore Mine
Dineega Corporation
Dinyea Corporation
Diomede Native Corporation
DOC/OMR
Dot Lake Native Corporation
Doyon, Ltd.
Dresslerville Colony
Duck Valley Reservation
Duckwater Shoshone Tribe
Dupont Specialty Chemicals
Dupont
Earthjustice Legal Defense Fund
Earth Science Consulting Service, Inc.
Eastern Shawnee Tribe of Oklahoma
Eastern Arizona Counties Organization
Eastern Shoshone Tribe
Echo Bay McCoy Cove
Echo Bay Minerals Company
Ecology Center of Southern California
EEEE, Inc.
Ekwok Natives Ltd.
Ekland Drilling
Eklutna, Inc.
Eldorado Gene's Music
Elem Indian Colony of Pomo Indians
Elim Native Corporation
Elk Valley Tolowa
Elko Band Colony
Elko Daily Free Press
Ely Indian Colony
Emery County, UT
Emmonak Corporation
Enchem Technology, Inc.
Energy Lab, Inc.
Energy West Mining
English Bay Corporation
Entrix, Inc.
Environmental Chemistries, Inc.
Environmental Protection Agency
Environmental Protection Agency, Office
  of Solid Waste
ERO Resources Corporation
ESA Consultants
Esmeralda County Board of
  Commissioners, NV
Eugene Sand & Gravel
Eureka Development Company, Ltd.
Eureka County Commissioners, NV
Euro-Nevada Mining
Evans Environmental Consultants
Evansville, Inc.
Eyak Corporation
Fairbanks Industrial Development
Corporation
Fairmile Gold Corporation
Fallon Colony
Far West Inc.
Federal Reservation Miwok
Federal Reservation
Federal Reservation Cahuilla Band of
  Indians
Federal Reservation Pomo
Federal Paiute Reservation
Federal Reservation Eastern Pomo
Federal Reservation Me-wuk
Federal Summit Fluids
Federal Reservation Rumsey Rancheria
Flandreau Santee Sioux Tribe
Fleischli Oil Company
Florida Canyon Mining, Inc.
Forest Hydrology Northwest
Fort Mcdermitt Paiute and Shoshone
  Tribe
Fort Belknap Tribes, Environmental
  Protection Agency
Fort Bidwell Indian Community Of
  Piaute Indians
Fort Belknap Indian Community Gros
  Ventre & Assiniboine Tribes
Fort Mcdowell Mohave-Apache Indian
  Community
Fort Mohave Tribal Council
Fort Mojave Reservation
Fort Peck Assiniboine & Sioux Tribes
Fort Sill Apache Tribe of Oklahoma
Franco-Nevada Mining Corporation, Inc.
Friends of The Rocky Mountain Front
Friends of Westwater
Gallagher & Kennedy
Gallatin Wildlife Association
Gana-A 'Yoo, Ltd.
Genwal
Geotemps, Inc.

Appendix H: Recipients of the Draft EIS

Getchell Gold Corporation
Gila River Pima-Maricopa Indian Community
Gilderstone Mining & Restoration Ventures
Givens, Funke & Work
Glamis Gold, Inc.
Glenbrook Nickel
Globe-Miami Chamber of Commerce
Gochnour & Associates, Inc.
Gold Hill Town Meeting, Inc.
Golden Sunlight Mines
Golden Eagle Group
Golder Associates
Golovin Native Corporation
Goshute Paiute Tribe
Goshute Reservation
Gough, Shanahan, Johnson & Waterman Attorneys at Law
Governor of Guam's Office
Governor of Northern Mariana Island's Office
Governor of American Samoa's Office
Graham Chamber of Commerce, AZ
Graham Co. Board of Supervisors, AZ
Grande Ronde Tribal Council
Grassroots Environmental Effective Network
Great Basin Mine Watch
Great Plains Rain Forest
Greater Wyoming Valley Audubon Soc.
Greater Fairbanks Chamber of Commerce, AK
Greater Yellowstone Coalition
Green Network
Greenlee County, AZ
Greenville Rancheria of Maidu Indians
Grindstone Indian Rancheria of Wintun-Wailaki
GSL Electric
Guardians of the Rural Environment Inc.
Gust Rosenfeld
Gwitchyaa Zhee Corporation
Hadum Inc.
Hagler Bailly
Haida Corporation
Harding Lawson Associates
Harold Runnels Building
Havasu Gold Seekers
Havasupai Tribe
Hecla Mining Company
Hee-Yea-Lindge Corporation
Heklet Association
Heritage Land Bank
High Country Citizens' Alliance
Hoh Indian Tribe
Homestake Mining Company
Hoopa Vally Tribe
Hopi Tribe
Hopland Band of Pomo Indians
Horizons West
Hualapai Tribe
Huekel Corporation
Humboldt City Board of Commissioners, NV
Humboldt County Commission, NV
Huna Totem Corporation
Hungwitchin Corporation
Hycroft
Hydrometrics, Inc.
Idaho Department of Lands
Idaho Rural Council
Idaho State Governor's Office
Idaho Mining Association
Igiugig Native Corporation
Iliamna Natives, Limited
Immanuel Congregational Church
Independence Mining Co, Inc.
Ingalik, Inc.
Inland Empire Public Land Council
Institute of Environmental Solutions
Institute for Policy Research
Northwestern University
Iowa Tribe of Oklahoma
Iowa Tribe of Kansas and Nebraska
Iqfijouaq Company
Isanotski Corporation
Island Mountain Protectors
J.M. Beck & Associates
J.R. Simplot Company, Smoky Canyon Mine
Jackson Band of Mewuk Indians
James Heimler Inc.
Jamestown S'klallam Tribe
Jamul Indian Village
JBR Environmental
Jicarilla Apache Tribe
Johnson Matthey
Judith River Farm
K'Oyitl'Ots'Ina, Ltd.
Kaibab-Paiute Tribe
Kake Tribal Corporation
Kaktovik Inupiat Corporation
Kalispel Business Council
Kalmiopsis Audubon
Kansas State Governor's Office
Karuk Tribe of California
Kasigluk, Inc.
Kavilco, Inc.Kaw Nation
Kennecott Minerals Company
Kennecott Ridgeway Mining Company
Kennecott Exploration Company
Kennecott Utah Copper Corporation
Kennecott/Borax
Kern County Planning Department
Kickapoo Traditional Tribe of Texas
Kickapoo Tribe of Kansas
Kickapoo Tribe of Oklahoma
Kijik Corporation
Kikiktagruk Inupiat Corporation
King Cove Corporation
King Mineral Resources Inc.
Kinross Gold
Klamath General Council
Klawock Heenya Corporation
Kleinfelder
Kluckwan, Inc.
Knight Piesold
Knikatnu, Inc.
Kokarmiut Corporation
Koliganek Natives, Ltd.
Kongnigkilnomiut Yuita Corp.
Koning, Inc.
Kootenia Tribe of Idaho
Kootznoowoo, Inc.
Kotlik Yupik Corporation
Koyuk Native Corporation
Kugkaktlik, Inc.
Kuitsarak, Inc.
Kuskokwim Corporation
Kuukpik Corporation
Kvaerner
Kwethluk, Inc.
Kwik Inc.
La Posta Band of Indians
Lake Superior Greens
Land & Water Consulting, Inc.
Land Management Consultants
Land & Water Fund of the Rockies
Lander County Commission, NV
Las Vegas Paiute Tribe
Laser, Inc.
Lassen County, CA
Law Offices of R. Vrooman
Le Tourneau Sales & Service Company
Levelock Natives, Ltd.
Lewis & Clark Water Quality Protection District, MT
Lewis & Clark County, MT
Lewistown District Resource Advisory Council
Lilburn Corporation
Lime Village Company
Lincoln County Public Lands Commission, NV
Little River Band of Pomo Indians
Los Coyotes Band of Mission Indians
Lovelock Paiute Tribe
Lower Elwha Reservation
Lower Brule Sioux Tribal Council
Lower Snake River Resource Advisory Council
Lucky Seven, Inc.
Lummi Indian Nation
Luzenac America Technical Center
Luzenac America Yellowstone Mine
Luzenac America, Inc.
Lyon County Public Lands Comm., NV
Makah Tribal Council
Malin Lewis Distributing Company
Manokotak Natives, Ltd.
Manzanita Band of Mission Indians
Mar-Industrial Falk Renew
Maricopa Audubon Society
Marigold Mining Company
Mary's Igloo Native Corporation
Maserculiq, Inc.
Mayer Equipment, Inc.
Mcclelland Laboratories, Inc.

Appendix H: Recipients of the Draft EIS

McCoy/Cove Mine
MCZ
Mec & Echo Bay Mines
MEIC
Mendas Chang Native Corporation
Meridian Gold Company
Mesa Grande Band of Mission Indians
Mescalero Apache Reservation
Metlakatla Indian Community
MGA Communications
Miami Tribe of Oklahoma
Middletown Rancheria of Pomo Indians
Miller Mountain Corporation
Mine Regulation Reporter
Mineral Policy Center Affiliation
Minerals Exploration Coalition
Mining & Environmental Services
Mining Journal Ltd.
Minnesota Department of Natural Resources, Division of Minerals
Moapa Band of Paiute Indians
Modoc Tribe of Oklahoma
Mohave County Public Land Use, CA
Montana River Action Network
Montana Department of State Lands
Montana State Governor's Office
Montana Trout Unlimited
Montana Mining Association
Montana Wildlife Federation
Moran & Associates
Morenci Unified School District, AZ
Morongo Band of Mission Indians
Motten & Associates
Mountain Pass Wind Company
Mountain Messenger
Mountain States Legal Foundation
MPH Consulting
MT Environmental Information Center
Mtm, Ltd.
Muckleshoot Indian Tribe
Nambe Pueblo
Nana Regional Corporation
Napaskiak Corporation
National Wildlife Federation
National Outdoor Leadership School
National Regional Environmental
National Citizens' Coal Law Project
National Mining Association
National Research Council
National Association of Mining Districts
National Parks andConservation Assoc.
Native Village of Tetlin
Native Village of Venetie
Navajo Nation
Nebraska State Governor's Office
Nelson Lagoon Corporation
Nevada Wildlife Federation's Endangered Species Alliance
Nevada Division of Minerals
Nevada Wildlife Federation
Nevada State Governor's Office
Nevada Landme's Association
Nevada Division of Wildlife
Nevada Mining Association
Nevada Cement
Nevada State Clearinghouse
Nevada Division of Environmental Protection
Nevada Bureau of Mines & Geology
Nevada Miners and Prospectors Assoc.
Nevada Wild Horse Commission
New Gold
New Mexico Mining/Minerals Division
New Mexico Environment Department
New Mexico Office of Lieutenant Governor
New Mexico Mining Association
New Mexico State Governor's Office
Newcrest Resources, Inc.
Newmont Gold Company
Newtok Corporation
Nez Perce Tribe of Idaho
Nima Corporation
Ninilchik Native Association, Inc.
Nisqually Indian Tribe
Nooksack Indian Tribe
North Start Borough Assembly, AK
North Santiam Watershed Council, OR
North Fork Rancheria of Mono Indians
North Dakota State Governor's Office
Northern Plains Resource Council
Northern Sierra Mining Council
Northern Cheyenne Tribe
Northern Alaska Environmental Center
Northway Natives, Inc.
Northwest Cancer Center
Northwest Pipe
Northwest Mining Association
Northwestern Mutual Life
NPRC
Nunakauiak Yup'ik
Nunamiut Corporation
Nunapitchuk, Limited
Oceanside Corporation
Office of the Governor-Jemez Pueblo
Oglala Sioux Tribal Office
OHM Remediation Services
Oil DRI Corp of America
Okanogan Highlands Alliance
O'Keefe Drilling Company
Old Harbor Native Corporation
Olgoonik Corporation
Omaha Tribe
ONDA
Oregon Department of Geology & Mining Industries
Oregon Natural Desert Association
Oregon Independent Miners
Oregon State Governor's Office
Oro Nevada
Orrick, Herrington & Sutcliff
Osage Tribe
Oscarville Native Corporation
Otoe-Missouria Tribe of Indians
Ottawa Tribe
Ounalashka Corporation
Ouray County Alliance
Ouzinkie Native Corporation
Paimiut Corporation
Paiute Shoshone Indians
Paiute Indian Tribe of Utah
Pala Band of Mission Indians
Parsons Behle & Latimer
Pascua Yaqui Tribe
Paskenta Band of Nomalecki Indians
Paug-Vik Inc., Ltd.
Pauma Band of Mission Indians
Pawnee Tribe of Oklahoma
Pechanga Band of Luiseno Indians
Pedro Bay Native Corporation
Pegasus Gold Corporation
People for the West
Peoria Tribe of Oklahoma
Pete Lien & Sons
Phelps Dodge Tyrone
Phelps Dodge Mining Company
Phelps Dodge Exploration Corporation
Phelps Dodge Morenci, Inc.
Picuris Pueblo
Pilot Point Native Corporation
Pilot Station, Inc.
Pinoleville Rancheri Of Pomo Indians
Pit River Tribe
Pitka's Point Native Corporation
Pittston Nevada Gold Company
Pittston Mineral Ventures
Placer Dome Inc.
Planning Information Corporation
Pleuss-Staufer (California) Inc.
Pojoaque Pueblo
Ponca Tribe of Nebraska
Ponca Tribe of Oklahoma
Port Graham Corporation
Port Gamble S'klallam
Poudre Environmental Consultants, Inc.
Powder River Basin Resource Council
Power Resources, Inc.
Prairie Band Potawatomi Tribe of Kansas
Precious Metals Producers
Preston Gates & Ellis
Prochnau-Sutherland Company
Progressive Leadership Alliance of Nevada
Project Underground
Protect Our Resources Coalition
Pruitt, Gushee & Bachtell
PTI Environmental Services Public Lands Foundation
Public Employees for Environmental Responsibility
Pueblo of San Juan Governors Office
Pueblo of Cochiti
Pueblo of Sandia
Pueblo of Acoma
Pueblo of Santo Domingo
Pueblo of Zia
Pueblo of San Felipe
Pueblo of Zuni
Pueblo of Isleta

Pueblo of Laguna
Puyallup Tribe
Pyramid Lake Paiute Tribe
Qanirtuuq, Inc.
Quapaw Tribe of Oklahoma
Quartz Valley Indian Community
Quechan Federal Reservation
Quechan Tribe
Quest International Management Services, Inc.
Quileute Nation
Quinault Business Committee
R.A.M. Enterprise, Inc.
Radiation Oncology Services
Ramah Navajo Chapter
Rand Mining Company
Redding Rancheria
Redi Insulation, Inc.
Redwood Valley Little River Band of Pomo Indians
Reno-Sparks Colony
Restoration Minerals Company
Rheox, Inc.
Rincon San Luiseno Band of Mission Indians
Riverside Cement Company
Roadrunner Prospectors
Rocky Mountain Air & Lubrication, Inc.
Rocky Mountain Ch. of the Sierra Club
Rocky Mountain Scout
Romarco Minerals
Root & Schindler, P.C.
Rosebud Sioux Tribe
Rough Country Drilling, Inc.
Round Mountain Gold Corporation
Royal Gold, Inc.
Rubber Engineering
Russian Mission Native Corporation
S.F. Phosphates
Sac and Fox Nation of Missouri
Sac and Fox Nation
Sagebrush Exploration
Saguyak Inc.
Salamatof Native Association, Inc.
San Ildefonso Pueblo
San Pasqual Band of Mission Indians
San Carlos Apache Tribe, Tribal Planning Office
San Manuel Band of Mission Indians
San Juan Southern Paiute Council
Sanak Corporation
Santa Ynez Band of Mission Indians
Santa Rosa Indian Community
Santa Rosa Band of Mission Indians
Santa Ana Pueblo
Santa Ysabel Band of Mission Indians
Santa Clara Pueblo
Sauk-suiattle Indian Tribe
Savoonga Native Corporation
Sealaska Corporation
Seldovia Native Association, Inc.
Seminole Nation of Oklahoma
Seneca-Cayuga Tribe
Sepa Resources
Seph-De-Ye-Ah Corporation
Seven Up Pete Joint Venture
Seven Oaks Ranch
Shaan Seet Inc.
Shaktoolik Native Corporation
Shea & Gardner
Shee Atika, Inc.
Shepherd Miller, Inc.
Sheppard Mullin Richter & Hampton Llp
Sherwood Valley Rancheria Of Pomo Indians
Shingle Springs Rancheria
Shishmaref Native Corporation
Shoshone-Bannock Tribes
Shumagin Corporation
Sierra Club Grand Canyon Chapter
Sierra Chemical Company
Sierra Club California/Nevada RCC Mining Committee
Siletz Indians of Oregon
Silver Valley, Peoples Action Coalition
Siskiyou Audubon Society
Siskiyou Project
Sisseton-Wahpeton Sioux Tribe
Sitnasuak Native Corporation
Sivuqaq Inc.
Skokomish Tribal Council
Skull Valley Band of Goshute Indians
Small Mine Operators Association
Soboba Band of Mission Indians
Society for Environmental Truth
Solomon Native Corporation
Sorptive Minerals Institute
South Fork Band Colony
South West Corporation
South Dakota State Governor's Office
South Dakota Office of School & Public Lands
Southern California Gem Industries
Southern Ute Tribe
Southern California Border Miners Assoc
Southwest Center for Biological Diversity
Southwestern Minerals Exploration Assoc.
Spearfish Canyon Preservation Trust Inc.
SPJV
Spokane Tribe of Indians
Squaxin Island Tribe
SRK
St.George Tanaq Corporation
St.Michael Native Corporation
Standing Rock Sioux Tribal Council
State of Utah-DCED
State of Nevada, Human Resources
State of Arizona
State of New Mexico, Environmental Department
State of New Mexico, Department of Fish & Game
State of Wisconsin
Stebbins Native Corporation
Steffen Robertson & Kirsten, Inc.
Stewart Colony
Stillaguamish Board of Directors
Stillwater Computer Assistance
Stillwater News
Stillwater Protective Association
Stoel Rives Llp
Stuyahok, Ltd.
Summit Valley Engineering
Summit Valley Equipment
Summit Lake Paiute Tribe
Summitville-San Luis Valley
Summo USA Corporation
Sundance Ventures
Superstition Mountain Treasure Hunters
Suquamish Tribal Council
Susanville Indian Rancheria
Swan Lake Corporation
Swinomish Indian Tribal Community
SWOMA
Sycamore Valley Environmental Awareness Group
Sycuan Band of Misson Indians
Table Mountian Rancheria Federal Reservation
Tanacross Inc.
Tanadgusix Corporation
Taos Pueblo
Tatitlek Inc.
Te-Moak Tribe of Western Shoshone Indians
Technical Writer's Ink
Teck Resources
Teller Native Corporation
Tesuque Pueblo
Thatcher Building Supply
The Gold Institute
The Surveyor's Exchange
The University of Chicago
The Conservation Fund
The Tulalip Tribes
The Chickasaw Nation
The Nature Conservancy
Thlopthlocco Tribal Town
Thomas Olsen, Associates, Inc.
Thompson Creek Mine
Three Affiliated Tribes
Tigara Corporation
Tihteet'Aii, Inc.
Toghotthele Corporation
Togiak Natives Limited
Tohono O'Odham
Tonkawa Tribe of Oklahoma
Tonto Apache Tribe
Torres Martinez Band of Mission Indians
Tovitna Limited
Tri-Star Design & Manufacturing
Tri-Con Mining Al, Inc.
Tri-State Truck & Equipment, Inc.
Tricon Metals & Services, Incorpoated
Trimac Transportation, Inc.
Trinidad Rancheria
Trout Unlimited

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Tule River Indian Tribe
Tulkisarmute Inc.
Tununermiut Rinit Corporation
Tuntutuliak Land Limited
Tuolumne Band of Me-Wuk Indians
Turtle Mountain Band of Chippewa
Twenty-nine Palms Reservation
Twin Hills Native Corporation
Tyonek Native Corporation
U.S. Representative Cannon's Office
U.S. EPA, Region VIII
U.S. EPA, Snake River Basin Field Office
U.S. Forest Service
U.S. Representative Hayworth's Office
U.S. Representative Shadegg's Office
U.S. Representative Stump's Office
U.S. Representative Herger's Office
U.S. Army Corps of Engineers
U.S. House of Representatives, Committee on Resources
U.S. Fish & Wildlife Service
U.S. Borax, Inc.
Umatilla Reservation
Unalakleet Native Corporation
Uago Corporation
United Keetoowah Band of Indians in Oklahoma
United Auburn Community of Indians
University of Nevada-Reno, Department of Mining
University of Utah
University of Montana
Upper Skagit Indian Tribe
Upper Lake Band of Pomo Indians
Upper Snake River Resource Advisory Council
Upper Columbia-Salmon Clearwater Resource Advisory Council
Uranerz USA
Utah School Trust
Utah Mining Association
Utah Dept. of Environmental Quality
Utah Oil, Gas & Mining
Utah State Governor's Office
Utah Geological Survey
Ute Indian Tribe
Ute Mountain Indian Tribe
Ute Indian Tribe Business Committee
Utu Utu Gwaitu Paiute
Valentine Mining Company
Vector Engineering, Inc.
Veex Company
Viceroy Resources
Viceroy International Exploration
Viejas Band of Mission Indians
Village of Andreafsky
Vista Gold, U.S. Inc.
VKO Mine Development Weaver District
W.R. Ryan Company
Wales Native Corporation
Walker River Paiute Tribe
Warm Springs Reservation
Washington Department of Ecology
Washington State Governor's Office
Washoe Tribe of Nevada and CaliforniaWells Band Council
West States Public Lands Coalition
Westech
Western Shoshone Defense Project
Western Mining Action Project
Western Mining Corporation
Western Arizona College
Western Governor's Association
Western Regional Council
Western Environmental Law Center
Western Organization of Resource Councils
Western States Minerals
Wharf Resources Partnership
Wharf Resources
White Mountain Native Corporation
White Mountain Apache Tribe
White Pine County Public Lands Commission, NV
Whitman & Company
Wichita and Affiliated Tribes
Wind River Originals
Winnebago Tribe of Nebraska
Winnemucca Indian Colony
Women in Mining Education Foundation
Women's Mining Coalition
Woodfords Community Council
Woodward Clyde
Worthington, Lennart & Carpenter
WP CO Land Users Advisory Committee, NV
Wyandotte Nation
Wyo-Ben, Inc.
Wyoming Chapter of the Sierra Club
Wyoming State Governor's Office
Wyoming Mining Association
Wyoming Game & Fish Department
WZI
Yak-tat Kwaan, Inc.
Yakama Nation
Yankton Sioux Tribal Business and Claims Committee
Yavapai-Apache Tribe
Yavapai-Prescott Indian Tribe
Yerington Paiute Tribe
Yomba Shoshone Tribe
Young & Kester Attorneys at Law
Ysleta Del Sur Pueblo
Yuma County Board of Supervisors, AZ
Yurok Council
Zho-tse, Inc.
Zortman Mining, Inc.

INDIVIDUALS

Brent Aaquist
R.L. Abbott
Rick Achermann
Patricia Acker
Teresa Adams
Norman Adams
Ron Adamson
Michael Aderhold
Butch Adkins
H. Adler
Joan Agamenoni
Susan Ahern
Mike Ahrens
Don Ainsworth
Audrey Akhavan
Russell Allen
Duane Allen
N. Allen
Sylvia Allen
Stephen Allen
Gary Allen
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Jennifer Allen
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Richard Allison, Jr.
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Carol Anderson
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Wade Anderson
Jeff Anderson
Linda Anderson
Jay Anderson
A.C. Anderson
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Jill Andrews
Dwayne Andrews
June Anna-fry
Fred Antinora
Steve Antonioli
Peter Apostolakis
Steven Arita
J. Armbrust
Timothy Arnold
Clay Arnold
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Carole Ashworth
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Cory Atiyeh
Marlene Atiyeh
David Atkins
Alfred Austin
Barbara Ayala
Jim Baca
Cindy Bachman
William Bachman
Tom Bachtell
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John Badovinac
Charles Bagley, Jr.
Sandy Bahr
Rod Baier
R. Bailey
Joan Bailey
Brent Bailey
Jerry Baird
Kenneth Baker
Daniel Baker
Eugene Baker
Anne Baldrige
John Balia
Sherman Ball
John Balla
Geoff Ballantyne
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John Barber
Cathy Barcomb
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Phil Barnes
George Barnes
Robert Barnes
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Dan Barrett
Steve Barrett
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Steven Barringer
James Barron
Dennis Bartlett
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Nathan Barton
Hank Bartos
Paul Bartos
Daniel Baskerfield
Jim Bates
Stephen Bates
Karri Bath
Edwin Battermann
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Dana Bauer
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Bert Brackett
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Bob Brister
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Paul Buckley
Alan Buffo
Shelley Bull
Angelita Bullets
Gina Bulock
Burton Bundy
Denton Bungarz
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Burggraf
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Peter Burk
Glynn Burkhardt
Mike Burl
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Isabella Burns
John Burrows

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Fernando Carrillo
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Larry Cassidy
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Benjamin Cayetano
Abeyta Cecilia
Bill Center
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Sonia & Estelle Chamberlain
Robert Chamberlin
David Chambers
Dennis Chambers
Danny Charlie
Jeffery Chase
Rocky Chase
Leon Chavet
Victor Chayet
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Vic Chevillon
J. Chisum
Elton Chorney
Ron Christensen
Pam Christensen
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George Cole
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Thomas Collins
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Clark Collins
Glendon Collins
Rick Collins
R. Collins
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Trent Crottens
Bob Croucher
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Palma Cullinane
Dean Culwell
Gary Cummings
Kirk Cunningham
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Stuart Dalheim
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Harold Downey
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Vivian Drake
Terry Drever-Gee
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Leo Drozdoff
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Carolyn Duckworth
Julie Dudley
Doren Dudley
Susan Dudley
Marianne Dugan
Sara Duhamel
Susan Duncan
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Gale Dupree
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Alan Edwards
Skip Edwards

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Peter Enticknap
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Rolin Erickson
Teresa Erickson
Lyle Ernst
Nick Ervin
Alan Erwin
Heather Estes
Antoinette Estrada
Glenn Eurick
Neil Eurick
Willis Evans
M. Evans
Patricia Evans
J. Evans
Frank Evans
John Evans
Deborah Evison
Rita Ewing
Ivan Ewing
D. Exline
Ted Eyde
Damian Fagan
Charlie Fahlgren
Jerome Fair
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Bruce Farling
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Donald Farquhar
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Sarah Faulconer
Tom Faulkner
Lynell Fay
James Fellin
Jami Fernette
Russ Field
Wade Fifield
Phil Fikkan
Jay Fischer
Jerry Fish
Sara Fishkin
Cindy Fisk
Tom Fitzgerald
John Fitzpatrick
William Flanigan
Michael Flannigan
Gus Fleischli
Ernest Fleming
F. Fletcher
Roger Flynn
Valerie Flynn-Wallace
Mark Folks
Charlie Foote
Joshua Footer
Brian Ford
Lindsay Ford
Jeff Fornear
Erin Forrest
Keith Fougitt
Fred Fox
Kenneth Frailey
Tom France
Glen Franklin
Tom Franeway
Stan Frasier
Julie Frazie
Krista Frazier
David Frederick
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